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DAIRY, FOOD AND ENVIRONMENTAL

Sanitation

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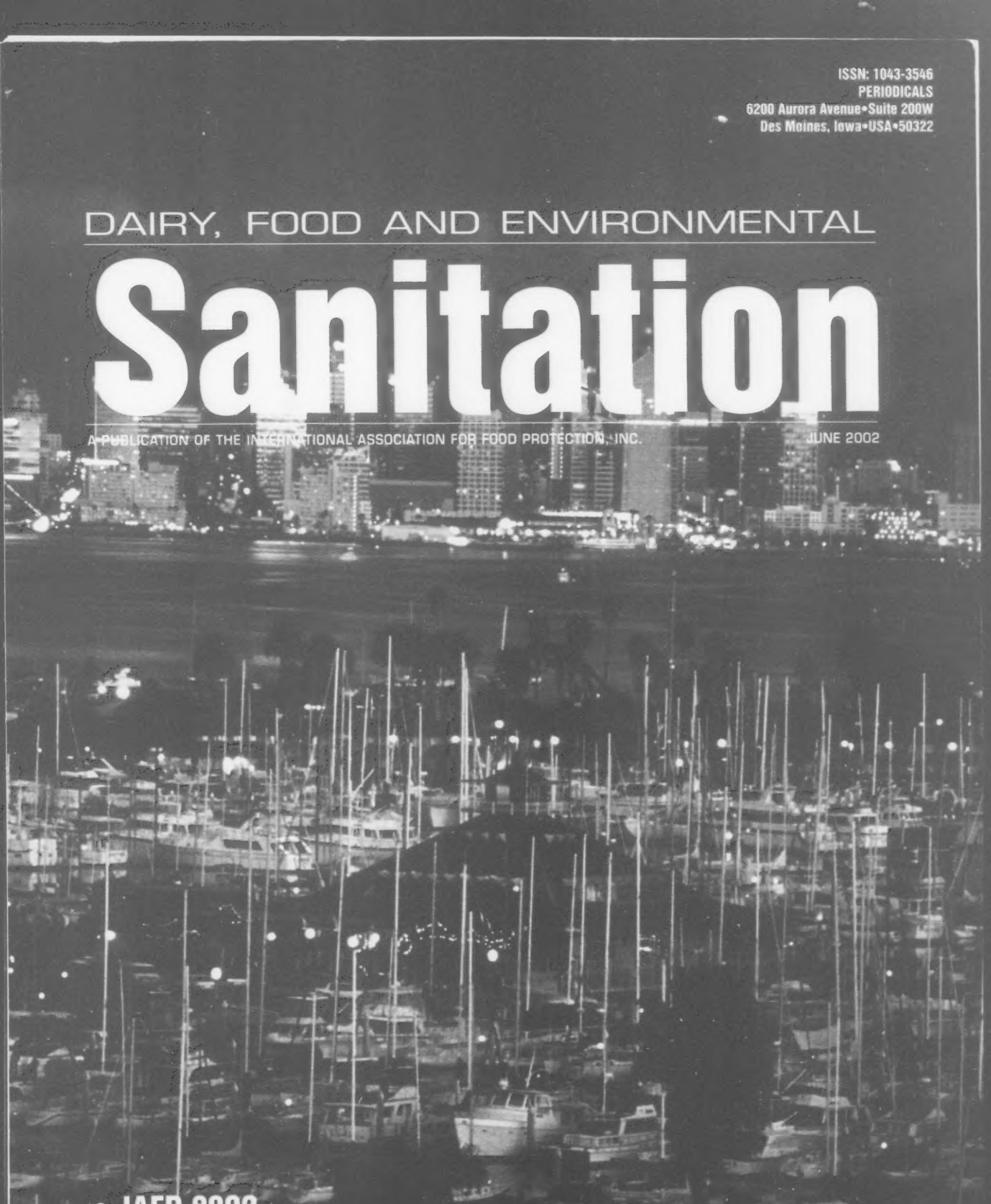

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International Association for Food Protection

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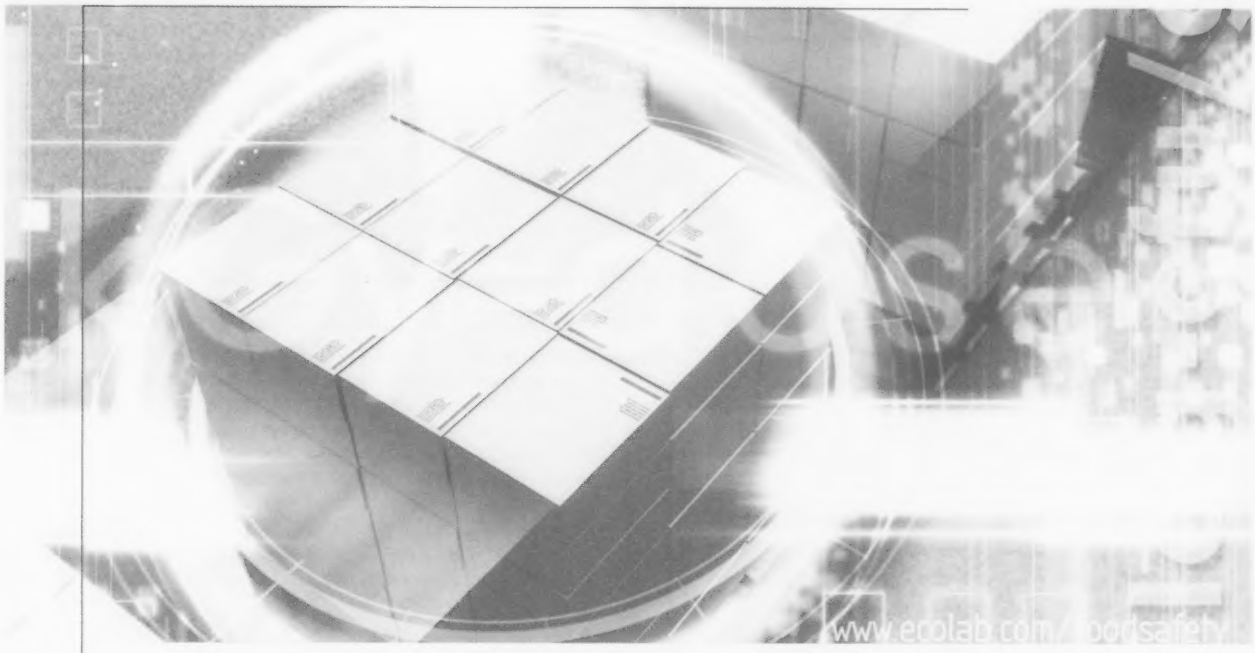

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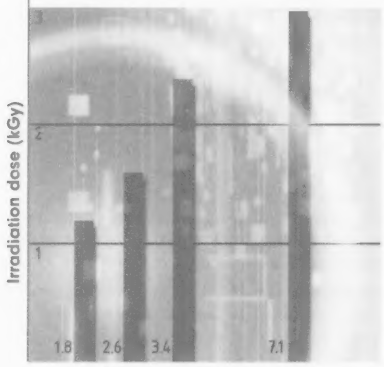

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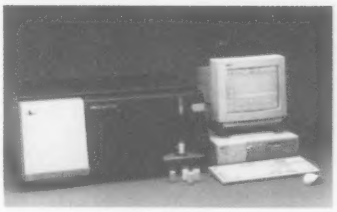

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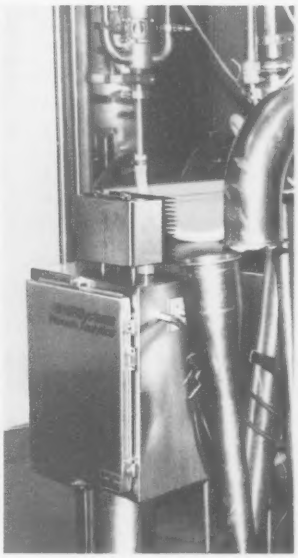

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Postcards from Iowa

By JAMES DICKSON
President

"I don't think that you will find a more appropriate meeting this year, if your focus and interest is in food safety"

Hello! We are in the final weeks, counting down to the Annual Meeting. If you haven't made your travel plans yet, there still is time. We have limited space in the hotel, but we certainly have room for you at the meeting. I would encourage you to come, if you can possibly work it in to your schedule. I don't think that you will find a more appropriate meeting this year, if your focus and interest is in food safety.

It all begins with our keynote address, the Ivan Parkin Lecture, on Sunday evening. Our Ivan Parkin lecturer this year is Dr. Mitchell Cohen, Director of the Division of Bacterial and Mycotic Diseases at the Centers for Disease Control and Prevention. Dr. Cohen will be speaking on food safety in the time of Anthrax. I think that all of us have re-evaluated our roles in food safety in an age of bioterrorism, and I think that Dr. Cohen's talk will not only be timely, but also help us put the importance of food safety in perspective.

As many of you know, the International Life Sciences Institute (ILSI) has partnered with IAFP for several years at our Annual Meeting. ILSI typically sponsors symposia at our meeting, organizing programs on relevant topics and bringing in speakers who might not otherwise attend our meeting. This year, ILSI will sponsor symposia on antibiotic resistant bacteria, *Listeria* research and chronic wasting disease. These topics are important to all of us in the food safety area, and certainly will provide timely updates on these subjects.

Other symposia at our program include sessions on viruses, GMOs, produce, meat and seafood. One change that you will notice this year is the schedule for Tuesday afternoon. In the past, we have had a general session, followed by the business meeting. This year, because of the number of quality symposia proposals submitted, we have five "mini-symposia", covering such topics as retail food safety, dairy waste management, public health and the control of *Clostridium perfringens*. In addition, we have two special lectures, one on ICMSF sampling plans and the other on risk assessment. Overall, we have a very diverse program of exceptional quality.

I do want to make a brief mention of the costs associated with the meeting. As some of you have commented, the cost of the hotel rooms are higher than we have had in the past. This is due entirely to the location, although I do not think that you will be disappointed. I recently spoke with someone who was looking for a lower cost hotel in the area, and found that our room rates at the Hyatt were lower than any of the surrounding hotels. The bottom line is simply that San Diego is an exceptional meeting location, but that it is somewhat more expensive than other locations.

While we're on the subject of San Diego, don't pass up the Monday Night Social. This year the social will be at the San Diego Zoo, and not only includes an evening meal, but allows you an opportunity to see the animals at a time when they become more active. You won't want to miss this, especially if your family is able to join you for the meeting.

When we selected San Diego as a meeting site three years ago, and then had to adjust the date to accommodate the different schedules, none of us could have dreamed that the events of the last several months could have happened. I think that the 4th of July will have a special significance to all of us this year, and I hope that you find some time to reflect on the things that are important to you. And if you get a chance, stay an extra day and see the fireworks in San Diego.

Same time, next month.

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We reached our goal of $100,000 for the Foundation Fund, but we are not done yet. We want the Foundation to contine to grow and be able to support the IAFP mission. Your past support is appreciated; your future support is needed!

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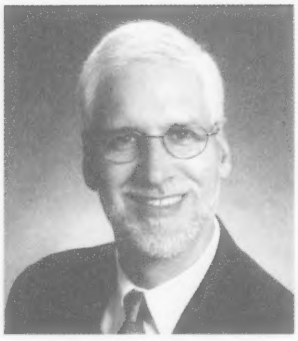
COMMENTARY

From the Executive Director



By DAVID W. THARP, CAE
Executive Director

"Have you tried *JFP* Online yet?"

This month I want to call to your attention two online services recently initiated by the Association.

Have you tried *JFP* Online yet? Hurry, hurry – *JFP* Online is available for your use FREE through August 31, 2002! We received lots of interest in placing the *Journal of Food Protection* Online and now it is a reality! Start at the IAFP Web site (www.foodprotection.org) and look for the *JFP* Online logo to learn how to gain access to *JFP* Online.

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Currently, we have the 2002 volume year available (January through June). We will add each additional issue on a monthly basis as they become available. After September 1, we will begin work on adding the 2001 volume year to *JFP* Online that will allow Internet access to those articles. As funding permits, we will be able to add earlier volume years to our archives.

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The second online service I want to call to your attention to is the ability to renew your Membership online. Just last month, we began sending an E-mail notice to Members due for renewal. Included in the E-mail was a link that takes you to a renewal form with your name, address and other pertinent information already filled out for a quick and easy renewal.

After clicking the link and arriving at the renewal form, simply review your name and address for correctness, make any necessary changes and then complete the form by including credit card information to renew your Membership. One very important element of the online renewal is that we are able to extend the same discounts for early Membership renewal just as we were doing with our paper invoicing system.

We hope that you will take advantage of this new service that will assist IAFP to save resources used to prepare and mail paper invoices. Be on the lookout for your E-mail and online renewal for your Membership in the International Association for Food Protection.

If you have questions or comments about either of these new online services, feel free to call our office or write me at E-mail: dtharp@foodprotection.org. Thank you for your support of IAFP!

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Factors Influencing Recovery of Micro-organisms from Surfaces by Use of Traditional Hygiene Swabbing

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SUMMARY

Although swabbing is widely used in hygiene monitoring and as a reference point for evaluating new methods, information is lacking with regard to the variables affecting the accuracy of the swabbing technique. A systematic evaluation of the individual components of the swabbing procedure – removal of bacteria from a surface, release of bacteria from the swab, and overall bacterial recovery – was conducted. Stainless steel squares were inoculated with known levels of bacteria and were sampled using different swab types and swab-wetting solutions. Increasing the amount of mechanical energy generated during swabbing significantly increased ($P < 0.05$) the number of bacteria removed from a surface. In general, however, protocols that allowed a higher percentage of bacteria to be removed from the surface hindered their release from the bud. Using swabs in conjunction with a swab-wetting solution significantly improved ($P < 0.05$) bacterial release, but in the majority of cases this brought about no significant improvement ($P > 0.05$) of overall bacterial recovery. The results of this study have been used to recommend ways in which the traditional swabbing protocol could be improved. However, the results also illustrate why traditional microbiology should not be presumed to be either the 'gold standard' or the optimum means for monitoring surface cleanliness.

A peer-reviewed article.

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INTRODUCTION

Traditionally, microbiological testing within the food industry has focussed on end-product analysis. Although results of such tests can indicate that problems have occurred during processing, they cannot establish the causes of microbial contamination *(35)*. Additionally, particularly with regard to high-risk products with a short shelf-life, by the time a defect is discovered a large amount of unsatisfactory or unsafe food may have been produced and sold. In an attempt to reduce the incidence of food poisoning, risk-based food safety management systems such as HACCP (hazard analysis critical control point) have been introduced and are increasingly being incorporated into legislation around the world *(17)*. This has led to a greater emphasis being placed upon the monitoring of in-process preventative control measures *(22)*.

Within the food industry, cleaning schedules are designed to reduce both food debris and microorganisms to levels that pose minimal risk to the safety and quality of the product *(19)*. However, surfaces that appear clean visually may still harbor large numbers of microorganisms that could contaminate the food. Such cross contamination has been identified as an important contributory factor in a significant proportion of general foodborne disease outbreaks recorded in both the UK and the USA *(11, 21)*. Therefore, for many foods, particularly those that are ready-to-eat, the cleanliness of food contact surfaces is likely to be identified as being critical to food safety *(9)*.

No standard protocol has yet been adopted by the food industry for surface hygiene monitoring *(17)*. Visual inspection of surfaces after cleaning can reveal gross deficiencies caused by the presence of visible food debris, but, most food operations require information on surface cleanliness that extends far beyond the sensitivity of this test *(23)*. Many authors have recommended the use of ATP bioluminescence as a means to provide, in real time, an estimate of total surface contamination, which is an indication of overall cleaning efficacy *(7, 9, 18, 28)*. However, although ATP bioluminescence can have great value in the initial evaluation of surface cleanliness, it does have its limitations. Examples are its inability to differentiate between microbial and soil ATP unless non-bacterial ATP is removed enzymatically before the assay, its inability to identify different organism types *(37)*, and in the absence of food debris, its inability to detect the presence of low numbers of bacteria on a surface *(26)*. Therefore, despite the fact that, within HACCP plans, routine hygiene monitoring should provide results rapidly and in time for remedial action to be implemented, the enumeration of microorganisms on food contact surfaces by use of conventional microbiological methods remains an important means of assessing the hygienic status of a variety of processing environments *(6, 25, 30)*.

The recommended procedure for the microbiological examination of food contact surfaces involves use of cotton-tipped hygiene swabs or direct surface contact methods such as dipslides *(27)*. Hygiene swabs may often be preferred because of the ease with which they can be used to sample difficult-to-clean, irregular, and uneven surfaces as well as the fully quantitative nature of the results attained. Accurate detection and enumeration of microbial contaminants, by use of the traditional swabbing technique relies initially upon the ability of the swab to remove the microorganisms from the surface, followed by their effective release from the swab bud and their subsequent recovery and cultivation. However, bacteria become increasingly difficult to remove by use of hygiene swabs, once they have adhered to the surface, particularly if they have become associated with a biofilm *(4, 32)*. Furthermore, the buds of cotton-tipped swabs retain some of the microorganisms removed from the surface, again resulting in an apparent reduction of recovery *(12)*. Additionally, inherent limitations are associated with the swabbing technique *(2, 15, 33)*. These include, for example, the lack of standardization of both the swabbing pattern and the pressure applied to the swab during sampling, both of which can lead to extreme variability in results *(16)*.

Information regarding the cleanliness of food contact surfaces continues to be of importance to the food industry and, despite its acknowledged shortcomings, which can lead to misleading results, use of hygiene swabs remains a common and accepted means of detecting bacteria on food contact surfaces. Therefore, in an attempt to find ways of optimizing the traditional swabbing protocol, this investigation conducted a systematic evaluation of each individual component of the swabbing procedure (i.e., bacterial removal, release, and overall recovery) to identify key areas where one or more of these component stages could be significantly improved.

MATERIALS AND METHODS

Preparation of bacterial culture

A member of the Enterobacteriaceae was used throughout this investigation and was of particular interest because of the potential pathogenicity of this group of bacteria as well as their wide use as indicator organisms.

A Gram negative, oxidase negative rod was isolated from a food environment and maintained on tryptone soya agar (TSA; Oxoid, Basingstoke, UK). The culture was sub-cultured every 4 weeks and was subsequently identified, using biochemical test strips (API 20E; bioMérieux), as being *Salmonella* spp.

A loopful of the bacterial culture was aseptically transferred into

100 ml of nutrient broth no. 2 (Oxoid) in a 250 ml conical flask and incubated at 37°C for 18 h in an orbital shaking incubator (Model 4518. Forma Scientific Inc., Marietta, Ohio) at 100 rpm. These culture conditions were found to yield approximately 10^9 CFU/ml.

After incubation, the culture was serially diluted using 1/4 strength Ringer solution (Oxoid).

Preparation of test surfaces

New squares (5 cm × 5 cm) of food-grade stainless steel (type 304) were conditioned before use. This involved them initially being placed in acetone and sonicated for 15 min using a Sonicleaner (Lucas Dawe Ultrasonics, London, UK) and then being soaked in a sodium hypochlorite solution. This process removed any grease associated with the manufacturing process. Thereafter, between each set of experiments, the coupons were immersed in Virkon (Antec International, Suffolk, UK) at the manufacturer's recommended usage level, before being rinsed, dried and autoclaved (121°C for 15 min).

Assessing removal of bacteria from the surface

The methodology used was based upon the direct surface agar plate (DSAP) technique described by Angelotti and Foter *(1)*.

Sterile coupons were aseptically transferred to petri dishes and 12.5 µl of the 10^{-4} bacterial serial dilution (approximately 10^5 CFU) was inoculated onto each square and spread evenly over the surface. The surfaces were then sampled, using a previously described standard swabbing protocol *(9)*, immediately after inoculation while still wet or after they had been allowed to air-dry for 1 h.

Once they had been sampled, the coupons were directly overlaid using plate count agar (PCA; Oxoid). Control surfaces were prepared identically to the test coupons but were directly overlaid without having been swabbed. All plates were incubated at 30°C for 48 h.

After incubation, the number of colonies present on the surface of those coupons that had been swabbed was compared to the number present on the surface of the control coupons. Each experiment was based on 10 replicates, and the percentage of CFU removed from the surface during swabbing was then calculated using equation 1.

$$N_{rem} = \left(\frac{N_{cc} - N_{tc}}{N_{cc}} \right) \times 100 \quad (1)$$

where N_{rem} = the percentage of bacteria removed from the surface; N_{cc} = the mean number of CFU present on the surface of the control (un-swabbed) coupons; N_{tc} = the number of CFU present on the surface of the test (swabbed) coupons.

During this investigation the surfaces were sampled using swabs tipped with sterile cotton (TSA-6; Technical Service Consultants Limited, Lancashire, UK), dacron (ULH 100S; Biotrace, Bridgend, UK), polyurethane foam (Hardwood Products Company, Guilford, ME), or alginate (TS7, Technical Service Consultants Limited).

Cotton swabs were used either dry or after being pre-moistened with one of a range of swab-wetting agents. These included an MRD-based solution described by Bloomfield *(3)*, containing Tween 80 (3% w/v), lecithin (0.3% w/v); and sodium thiosulphate (0.1% w/v), a detergent-based blend described by Tuompo et al. *(36)* consisting of a TRIS-acetate buffer (0.02M, pH 6.7), EDTA (0.1% w/v); and Triton-X-100 (1% w/v), and an MES-based buffer (10mM, pH 6.8) containing Tween 80 (0.03% w/v) and sodium thiosulphate (0.025% w/v). A biofilm disintegrating reagent (SprayCult®; Orion Diagnostica, Espoo, Finland) and 1/4 strength Ringer solution were also used to pre-moisten the swabs before use.

Assessing bacterial release from the swab bud and overall recovery

Sterile pre-moistened or dry swabs were directly inoculated with 12.5 µl of the 10^{-4} bacterial serial dilution. These swabs, together with those used to sample the coupons, were snapped off into either 10 ml 1/4 strength Ringer solution or 10 ml Calgon Ringers (Oxoid) to dissolve the alginate swabs. The swabs were vortexed to release the bacteria from the bud before 1 ml of the bacterial suspension was pipetted into a petri dish. Approximately 15 ml of PCA was added and the contents mixed well. Once set, the plates were incubated at 30°C for 24–48 h.

The percentage of CFU released from the swab bud was calculated using equations 2a or 2b. The efficiency of the sampling method (i.e., the overall percentage recovery) was calculated using equation 3; a method previously described by Whyte et al. *(39)*.

$$N_{rel} = \left(\frac{N \times d}{\left(\frac{N_{rem}}{100} \right) \times I} \right) \times 100 \quad (2a)$$

$$N_{rel} = \left(\frac{N \times d}{\left(\frac{N_{rem}}{100} \right) \times N_{cc}} \right) \times 100 \quad (2b)$$

$$E = \left(\frac{N \times d}{I} \right) \times 100 \quad (3)$$

where N_{rel} = percentage of bacteria released from the swab bud, N = mean number of CFU counted on replicate plates, d = dilution factor, N_{rem} = percentage of bacteria removed from the surface, I = number of CFU inoculated onto surface / bud, N_{cc} = mean number of CFU present on the surface of the control (un-swabbed) coupons, and E = efficiency of the bacterial surface sampling technique.

Modifications to the above procedures will be discussed in relation to the results to which they apply.

TABLE 1. Effect of swab wetness, surface dryness and sampling procedure on the efficiency of the traditional hygiene swabbing technique

			Efficiency of sampling method (mean % ± SD)	
			Wet swab*	Dry swab
Smaller sample volume†	Wet surface	Spread plate	3.22 ± 0.19	0.29 ± 0.47
		Pour plate	6.32 ± 2.82	1.12 ± 1.23
	Dry surface	Spread plate	0.07 ± 0.05	0
		Pour plate	0.15 ± 0.33	0
Larger sample volume‡	Wet surface	Spread plate	2.57 ± 0.64	2.12 ± 1.16
		Pour plate	12.84 ± 1.88	12.93 ± 3.83
	Dry surface	Spread plate	2.82 ± 0.78	1.13 ± 0.38
		Pour plate	12.28 ± 2.60	13.02 ± 4.58

* cotton-tipped swabs pre-moistened using 1/4 strength Ringer solution

† 12.5µl of 10^{-4} dilution (approx. 10^3 CFU) inoculated onto 5cm × 5cm coupon

‡ 100µl of 10^{-5} dilution (approx. 10^3 CFU) inoculated onto 5cm × 5cm coupon

Statistical analysis

Data analysis was performed using Microsoft Excel 97. Statistical significance set at a level of $P < 0.05$ was determined by use of t-tests or analysis of variance (ANOVA) combined with analysis of the least significant difference.

RESULTS

Factors affecting overall efficiency of the traditional hygiene swabbing technique

The efficiency of a bacterial surface sampling technique can be defined as its ability to recover microorganisms from a surface. Table 1 shows the effect of swab wetness, surface dryness, and sampling procedure on the efficiency of the traditional swabbing technique.

When the coupons were inoculated with a small sample volume (12.5 µl), the efficiency of the traditional swabbing procedure, when used to sample a wet surface, was significantly greater ($P < 0.05$) when a pre-moistened swab was used than when a dry swab was used. In both cases, the sampling efficiency could be significantly improved ($P < 0.05$) by applying the pour plate rather than the spread plate methodology.

Swabbing a dry surface rather than a wet surface significantly reduced ($P < 0.05$) the efficiency of surface hygiene swabbing. Furthermore, in this case neither swab wetness nor sampling procedure significantly improved the efficiency of the swabbing technique, which in all cases did not exceed 0.2%. Therefore, swabbing a dry surface with a dry swab was omitted from the majority of subsequent experiments.

Conversely, when coupons were inoculated with a larger sample volume (100 µl), surface dryness did not appear to affect the efficiency of the swabbing technique ($P > 0.05$). Swab wetness also had no significant effect; however, application of the spread and pour plate procedures resulted in a sampling efficiency of approximately 2% and 13%, respectively. This again suggests that pour plate methodology can significantly improve ($P < 0.05$) the efficiency of traditional hygiene swabbing.

Assessing removal of bacteria from the surface

Table 2A shows the percentage of bacteria removed from a wet and a dry stainless steel surface, using a sterile cotton swab pre-moistened with various swab-wetting agents. Depending on which agent was used to pre-moisten the swab, the percentage of bacteria removed from the wet and dry surface ranged from approximately 62% to 88% and from 60% to 89% respectively.

When a wet surface was sampled, dry swabs or swabs pre-moistened with either 1/4 strength Ringer solution or the MES buffer-based solution removed a significantly greater ($P < 0.05$) percentage of bacteria present on the surface than swabs pre-moistened with either the TRIS buffer-based solution, the 3% Tween solution, or Spraycult. The percentage of bacteria removed from a surface when swabs were pre-moistened with these latter three swab-wetting agents did, however, significantly increase when the surface sampled was dry. Consequently, there were no significant differences in the number of bacteria removed from a dry surface when cotton swabs were pre-moistened with any of the different swab-wetting agents, and in all cases a significantly greater percentage of bacteria were removed when the swab used was wet than when it was dry.

TABLE 2A. The mean percentage ± SD of a bacterial population removed from a wet and dry stainless steel surface using a sterile cotton swab pre-moistened using a range of different swab-wetting solutions

Percentage of bacterial population (CFU) removed from surface

	Swab-wetting solution					
	Dry swab	**1/4 strength Ringer solution**	**TRIS buffer-based solution**	**MES buffer-based solution**	**3% Tween solution**	**Spraycult**
Wet surface	88.20 ± 3.52	85.20 ± 1.74	67.16 ± 9.52	82.42 ± 2.31	62.96 ± 7.48	62.28 ± 4.72
Dry surface	60.32 ± 8.89	79.81 ± 12.02	89.33 ± 5.59	87.47 ± 3.97	80.05 ± 9.11	80.74 ± 8.90

TABLE 2B. The mean percentage ± SD of a bacterial population removed from a wet and dry stainless steel surface using a variety of different swab types

Percentage of bacterial population (CFU) removed from surface

		Swab type			
		COTTON	**DACRON**	**FOAM**	**ALGINATE**
Wet surface	Wet swab*	69.58 ± 8.76	38.18 ± 23.49	70.38 ± 6.25	55.85 ± 8.50
	Dry swab	50.64 ± 13.95	36.34 ± 19.56	71.79 ± 7.69	62.74 ± 10.33
Dry surface	Wet swab*	63.24 ± 21.65	14.17 ± 37.04	85.32 ± 6.20	72.79 ± 11.56

* swabs pre-moistened using 1/4 strength Ringer solution

Table 2B shows that the percentage of bacteria removed from a wet and a dry stainless steel surface using a variety of different swab types, ranged from approximately 36% to 72% and from 14% to 85% respectively.

When a wet surface was sampled, wet cotton and foam swabs (pre-moistened with 1/4 strength Ringer solution) removed significantly more ($P < 0.05$) bacteria from the surface than pre-moistened alginate swabs. Additionally, dry foam swabs removed significantly more bacteria from the wet surface than dry cotton swabs. Wet or dry, these three swab types removed significantly more ($P < 0.05$) bacteria from a wet surface than wet or dry dacron swabs.

When a dry surface was sampled, pre-moistened foam swabs removed a significantly greater percentage of bacteria from the surface than pre-moistened cotton swabs. Pre-moistened dacron swabs again removed significantly fewer ($P < 0.05$) bacteria from the surface than any of the other three swab types.

Assessing the release of bacteria from the swab

Table 3A shows the percentage of bacteria released from different swab types, that prior to direct inoculation, had been pre-moistened with a range of different swab-wetting agents. The percentage of bacteria released from the bud of the cotton, dacron, and foam swabs was significantly lower ($P < 0.05$) when the swabs were dry than when the swabs were pre-moistened with any of the swab-wetting agents. However, except when the 3% Tween solution was used to pre-moisten the bud, the percentage of bacteria released from a directly inoculated dry alginate swab did not differ significantly from that released from pre-moistened alginate swabs.

In general, the percentage of bacteria released from any directly inoculated pre-moistened swab was significantly higher when the swab was foam or alginate-tipped. However, the percentage of bacteria released from cotton and dacron-tipped swabs could be significantly improved by pre-moistening the swabs with 1/4 strength Ringer solution.

Tables 3B and 3C show the percentage of bacteria released from different swab types pre-moistened with a variety of swab-wetting agents and used to sample a wet or dry stainless steel surface. The results take into consideration the percentage of either the original

TABLE 3A. The mean percentage ± SD of bacteria released from a range of directly inoculated swabs that had been pre-moistened using a variety of different swab-wetting solutions

	Percentage of inoculum (CFU) released from bud			
	Swab type			
	COTTON	DACRON	FOAM	ALGINATE
Swab-wetting solution				
Dry swab	3.20 ± 0.43	1.75 ± 1.13	19.76 ± 3.92	34.52 ± 10.51
1/4 strength Ringer solution	46.55 ± 1.47	25.79 ± 10.75	45.53 ± 4.95	28.65 ± 11.57
TRIS buffer-based solution	8.92 ± 1.62	15.61 ± 5.36	44.51 ± 6.79	20.56 ± 6.16
MES buffer-based solution	10.72 ± 1.99	18.38 ± 5.39	42.81 ± 3.84	39.22 ± 5.03
3% Tween solution	18.96 ± 4.48	4.99 ± 2.81	48.82 ± 6.18	49.84 ± 6.18
Spraycult	25.55 ± 7.49	16.15 ± 2.76	34.96 ± 6.20	25.89 ± 6.52

TABLE 3B. The mean percentage ± SD of bacteria released from cotton swabs pre-moistened using a range of different swab-wetting agents, taking into consideration the number of bacteria each had removed from a wet and dry stainless steel surface during sampling

		Percentage of bacterial population (CFU) removed from surface					
		Swab-wetting solution					
		Dry swab	1/4 strength Ringer solution	TRIS buffer-based solution	MES buffer-based solution	3% Tween solution	Spraycult
Wet surface	†	1.08 ± 0.96	7.98 ± 0.56	9.22 ± 2.94	8.67 ± 3.40	15.23 ± 9.89	9.18 ± 2.26
	‡	9.00 ± 8.01	66.58 ± 4.71	76.86 ± 24.52	72.26 ± 28.58	127.03 ± 15.93	76.50 ± 18.89
Dry surface	†	0	0.17 ± 0.23	0	0.39 ± 0.48	0.42 ± 0.42	0.02 ± 0.02
	‡	0	5.81 ± 7.96	0	13.26 ± 16.24	14.49 ± 14.49	0.57 ± 0.79

† taking into consideration the percentage of bacteria removed from the original inoculum

‡ taking into consideration the percentage of bacteria removed from the number of colonies counted on control (un-swabbed) coupon

inoculum or the number of colonies on the control coupons that were removed during sampling (Tables 2A and 2B) and are, therefore, based on the number of colonies theoretically present on the bud of the different swab types.

When a wet surface was sampled, the percentage of bacteria released from a cotton swab was significantly lower when the swab was dry than when it was wet. Although the majority of swab-wetting agents did not appear to significantly affect the percentage of bacteria released from a cotton swab (Table 3B), bacterial release did appear to be significantly increased ($P < 0.05$) when the swab was pre-moistened with the 3% Tween solution.

When a dry surface was sampled, neither swab wetness nor swab-wetting agent significantly affected the percentage of bacteria released from a cotton swab (Table 3B). Furthermore, the swab type used to sample either a wet or a dry surface did not significantly increase the percentage of bacteria released from a swab bud (Table 3C).

Factors improving the efficiency of the swabbing technique

Tables 4A and 4B show the effect of swab-wetting agent and swab type on the efficiency of the traditional swabbing technique.

TABLE 3C. The mean percentage ±SD of bacteria released from different swab types, taking into consideration the number of bacteria each had removed from a wet and dry stainless steel surface during sampling

			Percentage of bacterial population (CFU) released from swab bud			
			Swab type			
			COTTON	DACRON	FOAM	ALGINATE
Wet surface	Wet swab*	†	2.37 ± 1.04	3.14 ± 2.55	3.84 ± 2.35	6.62 ± 3.67
		‡	23.51 ± 10.26	31.17 ± 25.32	48.04 ± 23.28	65.66 ± 36.37
	Dry swab	†	0.10 ± 0.22	0.14 ± 0.31	0.42 ± 0.38	0.56 ± 0.45
		‡	0.98 ± 2.19	1.36 ± 3.05	4.14 ± 3.78	5.53 ± 4.50
Dry surface	Wet swab*	†	3.60 ± 5.48	0	0.49 ± 0.66	4.84 ± 9.25
		‡	35.71 ± 54.33	0	4.81 ± 6.59	47.95 ± 91.73

* swabs pre-moistened using 1/4 strength Ringer solution

† taking into consideration the percentage of bacteria removed from the original inoculum

‡ taking into consideration the percentage of bacteria removed from the number of colonies counted on control (un-swabbed) coupon

Although swab type did not significantly affect swabbing efficiency (Table 4B), using any pre-moistened swab significantly improved ($P < 0.05$) the efficiency of the swabbing technique compared with results when dry swabs were used (Table 4A). Pre-moistening a cotton swab with the 3% Tween solution resulted in a sampling efficiency of 9.6%, significantly higher than the efficiency with any other swab-wetting agent.

DISCUSSION

Becase of the time involved in obtaining microbial data, it is not feasible to use microbiological analysis for monitoring within HACCP *(22)*; nevertheless, microbiological methods can be used for validation and verification purposes *(10)*.

After being used to sample a surface, a swab can be rubbed over the surface of an agar plate. Although this spread plate technique can be used to make a gross estimate of surface contamination, as an enumeration technique it is very inaccurate *(12)*. Vortexing the swab in a diluent, a more effective means of breaking up clumps of bacteria, is more likely to measure the number of individual bacterial cells present on a surface *(14)*. This is reflected in Table 1, which suggests that in the majority of cases the efficiency of the swabbing technique can be significantly improved if the pour plate rather than the spread plate procedure is applied. However, in terms of the minimum detection limit, the extra dilution factor created by adding the swab to 10 ml of diluent lowers the sensitivity of the pour plate technique. It is acknowledged, therefore, that in comparison to the pour plate procedure, spread plate methodology is capable of detecting lower numbers of bacteria on a surface *(26)*.

Although the pour plate technique is widely used and accepted, previous studies have highlighted problems associated with the recovery of bacteria, particularly from a dry surface, with traditional hygiene swabbing *(9, 26)*. This is again illustrated in Table 1, which shows that when a surface was inoculated with a relatively small sample volume (12.5 µl), the efficiency of the swabbing technique was greater when the surface sampled was wet than when it was dry. It has been suggested that this reduction in swabbing efficiency is due to a loss in microbial viability during drying *(9)*. However, Stone and Zottola *(34)* have shown that, despite appearing smooth to the unaided eye, stainless steel viewed under a microscope is very rough and has distinct flaws, that could harbor bacterial cells. Should water and/or nutrients also be present, then microbial survival may be enhanced, and this was evident in the current study. The number of colonies on the un-swabbed control coupons, directly after inoculation, was reduced by 45% after the 12.5 µl inoculum had been allowed to dry on the surface for 1 h. By contrast, when the coupons were inoculated with a larger sample volume (100 µl), there was no apparent reduction in the number of colonies present on the coupons after 1 h and no reduction in the efficiency of the swabbing technique.

TABLE 4A. The effect of swab-wetting agent upon the efficiency of the traditional hygiene swabbing technique

	Efficiency of sampling procedure (mean % SD)					
	Swab-wetting solution					
	Dry swab	1/4 strength Ringer solution	TRIS buffer-based solution	MES buffer-based solution	3% Tween solution	Spraycult
Wet surface	0.95 ± 0.85	6.80 ± 0.48	6.19 ± 1.98	7.14 ± 2.81	9.59 ± 1.19	5.71 ± 1.41
Dry surface	0	0.14 ± 0.19	0	0.34 ± 0.42	0.34 ± 0.34	0.01 ± 0.02

TABLE 4B. The effect of swab type upon the efficiency of the traditional hygiene swabbing technique

		Efficiency of surface sampling procedure (mean % ± SD)			
		Swab type			
		COTTON	DACRON	FOAM	ALGINATE
Wet surface	**Wet swab***	1.65 ± 0.72	1.20 ± 0.97	2.70 ± 1.65	3.70 ± 2.0
	Dry swab	0.05 ± 0.11	0.05 ± 0.11	0.30 ± 0.27	0.35 ± 0.29
Dry surface	**Wet swab***	0.55 ± 0.84	0	0.10 ± 0.14	0.85 ± 1.63

* swabs pre-moistened using 1/4 strength Ringer solution

These results do suggest that a loss in microbial viability can contribute to the reduced efficiency of surface hygiene swabbing. However, even when a loss in microbial viability did not occur, as when a wet surface was sampled, and when the pour plate procedure was applied, the efficiency of the swabbing technique still ranged, depending on inoculum size, from only approximately 6% to 13% (Table 1). Other factors, therefore, must be influencing the recovery of microorganisms from the surface.

Removal of bacteria from the surface

The increased adhesion of bacteria to dry surfaces has also been suggested as a reason for differences in results obtained with hygiene swabs *(9)*. This raises issues regarding the numerous swab-wetting agents available and their effectiveness in picking up bacteria from surfaces. However, the results presented in Tables 2A and 2B suggest that mechanical rather than chemical factors have the greatest effect on the number of bacteria removed from a surface. Any condition or practice that increases the amount of mechanical energy generated has been shown to improve the hygienic efficiency during handwashing. The use of coarse paper towel, for example, results in a greater proportion of the resident flora being removed from the hands than when a softer cloth towel is used *(24)*. Similarly, during the present investigation, the use of a coarse foam swab resulted in a greater proportion of bacteria being removed from a surface than when swabs tipped with a softer material were used (Table 2B).

The dacron swabs used in this investigation removed significantly fewer ($P < 0.05$) bacteria from both a wet and a dry surface than either the cotton, sponge or alginate swabs did (Table 2B). The main reason was possibly not the dacron bud itself, but rather the greater shaft flexibility in comparison to the other swab types, which enabled less pressure and consequently less mechanical energy to be applied during swabbing. This resulted in removal of only 38% of bacterial colonies from a wet surface; however, the effect of such a reduction in mechanical energy

was even more apparent when dacron swabs were used to sample a dry surface. During this investigation the bacteria were re-suspended in 1/4 strength Ringer solution, a non-growth enhancing medium, before being inoculated onto the steel surfaces. Researchers have speculated that low-nutrient systems may enhance adherence *(5)* and this possible increase in the strength of bacterial attachment to the surface coupled with a low level of mechanical energy, resulted in only 14% of bacterial colonies being removed by the dacron swabs from a dry surface.

The cotton and alginate swabs used in this study had similar wooden shafts, allowing equal pressure to be applied with both swab types. However, when a wet surface was sampled, pre-moistened cotton swabs removed a significantly greater proportion of the bacteria present than did pre-moistened alginate swabs (Table 2B). This concurs with findings of previous studies *(36)* and may be due to the natural absorbency of cotton fibers. Cotton, a natural fiber, is composed primarily of cellulose, which is very absorbent *(8)*. Therefore, in comparison to other swab types, cotton swabs may be capable of absorbing a greater volume of liquid present on a surface, together with any bacteria contained within it that become dislodged from the surface during swabbing. When a dry surface was sampled and the effective removal of bacteria relied solely upon the attachment of the cells to the swab bud, the percentage of bacteria removed using a cotton swab did not differ significantly from that removed by an alginate swab.

The two main factors influencing the amount of mechanical energy that can be generated during swabbing, and consequently the number of bacteria that can be removed from the surface, appear to be the inherent properties of the swab bud itself and the degree of pressure that can be applied to the swab during sampling. However, various substances can also be used to improve the detachment of bacteria from surfaces. The addition of a detergent to a swabbing solution, for example, lowers the surface tension of that solution, increasing its ability to contact the entire surface area being sampled (its wetting effect) and helping it to detach cells to be flushed from the surface (its rinsing effect) *(31, 36)*. Furthermore, the incorporation of a detergent may prevent the re-disposition of lifted organisms back onto the surface.

During this investigation, cotton swabs were pre-moistened using a range of different swabbing solutions. When used to sample a wet surface, those swabs which had been pre-moistened with solutions containing comparatively high concentrations of detergent-type substances removed significantly fewer bacteria ($P < 0.05$) than both the dry swabs and those pre-moistened with solutions containing little or no detergent (Table 2A). In this case, the detergent in the swabbing solution may also have reduced the surface tension of the liquid on the surface. This enhanced wetting effect may have reduced the mechanical energy generated by the swabbing action and thus reduced the number of bacteria removed from the surface.

It has been documented that removal of bacteria from a dry surface can be significantly improved by using a wet swab *(31)*. This is illustrated in Table 2A, which suggests that although dry swabs are capable of removing 60% of the bacteria present on a dry surface, use of a swab-wetting solution can result in removal of 80% to 90% of the bacterial population. However, despite the possibility of increased bacterial adherence, the rinsing effect of the detergent-based solutions did not appear to remove a significantly greater proportion of bacteria from a dry surface than did basic 1/4 strength Ringer solution. It is acknowledged, however, that the bacteria used in this study were allowed to adhere to the surface for only 1 h; true biofilms include not only the adherent cells but also the matrix of extracellular material produced by the bacteria *(20)*. Detergent-based swabbing solutions can also possess emulsifying, saponifying, peptizing and dissolving properties *(31)* and may, therefore, be more effective than non-detergent-based solutions in removing bacteria associated with a biofilm.

In this case, however, the results presented in Tables 2A and 2B suggest that despite the possibility of bacteria adhering more strongly to a dry surface, the reduced efficiency of the swabbing technique shown in Table 1 is probably not due to a reduced number of bacteria removed from the surface.

Release of bacteria from swab bud

Reliable plate counts will be obtained only if microorganisms that have been removed from the surface, are effectively released from the swab bud.

The two sets of data presented in Tables 3B and 3C take into consideration the percentage of either the original inoculum or the number of colonies on the control coupons that were removed during sampling. The results therefore represent the percentage of bacteria theoretically present on the swab that was released from the bud during vortexing. Angelotti et al. *(2)* reported that the direct surface agar plate technique was capable of detecting between 88.5% and 99.3% of bacterial spore contamination on nonporous surfaces. However, in the current investigation, the number of CFUs present on the wet control coupons was approximately 10% of the initial inoculum. This may have been due to a relatively high degree of cellular aggregation and may account for the differences between the two sets of results presented in both Tables 3B and 3C.

When a wet surface was sampled with a cotton swab pre-moistened using the 3% Tween solution, the percentage of bacteria released from the bud was significantly higher than when any other swab-wetting agent was used (Table 3B). Previous studies have used a 1% Tween 80 solution to prevent cell clumping *(13)*. The amount of Tween 80 present on the bud of the swabs during this study may have been sufficient to facilitate breakup of clumps of bacterial cells during

vortexing, thus improving bacterial recovery.

Although not statistically significant ($P > 0.05$), the percentage of bacteria released from the cotton swabs was less than that released from the other three swab types when a wet surface was sampled (Table 3C). This could have been due to the greater absorbency of the cotton fibres leading to liquid, together with any microorganisms present in it, being absorbed into and becoming trapped within the fibres of the cotton bud. Those characteristics, therefore, that may enable a cotton swab to remove a high proportion of bacteria from a surface may be the same characteristics that prevent those bacteria from being released from the swab bud. Conversely, despite removing a significantly smaller number of bacteria from a wet surface, dacron swabs appeared to release a statistically similar proportion to that released from the other three swab types. Dacron is a polyester, and polyester fiber is one of the least absorbent of all fibers; consequently, almost all moisture will lie on the surface of a dacron swab rather than penetrate the bud *(8)*. As a result, fewer bacteria may become trapped within the bud, allowing vortexing to remove a greater proportion of them.

How the absorbency of the swab appears to influence the percentage of bacteria removed from the bud is further illustrated in Table 3B. These results indicate that significantly fewer bacteria were released from a dry cotton swab than from pre-moistened swabs. Saturation or near-saturation of the swab bud prior to sampling a wet surface may prevent all of the liquid removed from the surface during swabbing, together with those microorganisms in it, being absorbed and becoming trapped within the swab bud.

The results presented in Table 3A also suggest that trapping of bacteria in the swab bud is an important factor in reducing the recovery of microorganisms, particularly from a dry swab. Researchers have previously reported on the advantages of placing a calcium alginate swab in a sodium hexametaphosphate solution (Calgon Ringers). It has been stated that in a short period of vigorous shaking, the calcium alginate dissolves, thereby freeing trapped organisms and reesulting in bacterial counts higher than those obtained with a cotton swab *(38)*. In the present study, the percentage of bacteria released from a directly inoculated, dry alginate swab was significantly greater ($P < 0.05$) than that released from the other three swab types (Table 3A). Furthermore, except when a directly inoculated alginate swab was pre-moistened with the 3% Tween solution, the percentage of bacteria released from a dry swab did not significantly differ ($P > 0.05$) from that released from a pre-moistened swab.

The results in Table 3B also suggest that after an alginate swab is used to sample a surface, a greater percentage of bacteria are released from it than from the other swab types tested. However, because of the extreme variability in the number of bacteria recovered from the replicate samples, these differences were not significantly different ($P > 0.05$). Close agreement between the number of bacteria released from cotton and from alginate swabs has also been observed in a previous study, the authors of which hypothesized that calcium alginate or sodium hexametaphosphate may exhibit some inhibitory properties *(2)*. However, unpublished data from experiments carried out during the present investigation suggest that this is not the case.

Variations in swab bud size could influence the ease and degree of dissolving of the calcium alginate swabs, and during this study it was noted that alginate swabs did not dissolve completely; rather, a slightly viscous suspension was formed. A more simple scenario, therefore, for the perhaps unexpected similarity in the percentage of bacteria released from the alginate and other three swab types is that the bacteria may simply remain bound either to undissolved fibers or to those fibers present in solution.

The percentage of bacteria released from a directly inoculated bud was significantly greater than that released from swabs used to sample a wet surface. This may have been due to the pressure applied to the swab during surface sampling causing the bacterial cells to become more firmly adsorbed to the fibers. The percentage of bacteria released from a swab used to sample a dry surface was significantly lower than that released from swabs used to sample a wet surface. Furthermore, changing swab type or altering the swab-wetting agent did not improve bacterial release. Changes in environmental conditions during the process of attachment, for example, can affect the genetic responses of bacteria, resulting in a change of phenotype *(4)*. However, such morphological changes are unlikely to occur after an attachment time of only 1 h. Bacteria are also subjected to a certain amount of stress during the swabbing procedure itself, and it has been suggested that plate count methods may not detect all viable cells, particularly those injured by environmental stresses *(40)*. Further work, therefore, could be carried out using epifluorescent microscopy to determine the number of viable cells present on the swab bud before and after vortexing.

CONCLUSION

The main purposes of ensuring high standards of cleanliness in food premises are to maintain shelf life and to protect public health by ensuring that food does not become contaminated. Although various methods of detecting microbial surface contamination exist, there is no consensus as to an accepted standard method; however, the methodology used should permit fully reliable detection even when organisms are present in low numbers. The use of hygiene swabs to sample food contact surfaces remains an important means of measuring the effectiveness of sanitation procedures, although the issues previously discussed all affect the overall efficiency of the swabbing technique (Tables 4A and 4B).

In general, results of this study suggest that the inherent properties of a swab that allow a relatively high percentage of bacteria to be removed from the surface tend to hinder their release from the bud, when a wet surface is swabbed. As a result, swab type did not appear to have a significant effect upon the overall efficiency of surface hygiene swabbing (Table 4A). Similarly, the mechanical energy generated by the use of dry swabs allowed them to remove a high proportion of bacteria from the surface; however, premoistening the swabs appeared to improve bacterial release and therefore sampling efficiency.

Although removing comparatively fewer bacteria from a wet surface, cotton swabs premoistened with a 3% Tween solution showed improved efficiency of the swabbing technique. It is unclear, however, whether this was due to an increase in the number of bacteria released from the swab or to enhanced anti-clumping properties of the swabbing solution. Nevertheless, within the food industry it is advisable that solutions used to premoisten swabs include agents capable of neutralizing the effects of residual detergents and/or disinfectants, that may be picked up by the swab during sampling. Because Tween 80 can neutralize the effects of quaternary ammonium compounds (QAC) *(29)*, the advantages of its incorporation in a swab-wetting solution may be two-fold.

During this investigation, therefore, the optimum sampling efficiency was achieved by swabbing a wet surface using a cotton swab pre-moistened with the 3% Tween solution; however, efficiency was still only 9.6%. Results strongly suggest that release of bacteria from the swab bud is the most important factor in the recovery of microorganisms from surfaces by use of the traditional swabbing technique. However, despite evaluating the effects of both sonication and increased vortex time, this investigation was unsuccessful in discovering a more effective means of releasing the bacteria. Additionally, no explanation has been found as to why the problems associated with bacterial release appear to be exacerbated when a dry surface is swabbed, and as a result further research is warranted. Finally, although unable to provide definitive answers, this study does demonstrate that traditional microbiology should not necessarily be presumed to be either the 'gold standard' or the optimum means for monitoring surface cleanliness.

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Control of Product Temperatures during the Distribution of Retail Ready Beef to Stores and Vacuum Packaged Beef to Restaurants

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SUMMARY

Temperature histories were collected from product in consignments of retail-ready packs of chilled beef prepared at two central cutting plants for delivery to retail stores, and in consignments of vacuum packaged, chilled beef dispatched from two warehouses to restaurants. Multiple consignments of product from each facility were loaded to individual refrigerated trucks for sequential delivery to retail stores or restaurants. Times between the dispatch and delivery of product ranged from <1 to about 40 h, although some temperature histories extended to longer times because of storage after delivery. Despite the occurrence of excursions to warm temperatures in some histories, the temperatures of products were generally maintained or reduced during transportation. Estimations of bacterial proliferation by integration of temperature histories with respect to models that describe the dependencies on temperature of rates of bacterial growth indicated that the proliferations of *Escherichia coli, Listeria monocytogenes* and lactic acid bacteria were all adequately contained during the transportation of product. However, storage efficiency factors calculated for temperature histories ranged widely for product from all facilities, which indicates that there continues to be extensive possibilities for increasing product storage life by improved control over product temperatures, particularly during storage.

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INTRODUCTION

Raw meat must be maintained at chiller temperatures (≤ 4°C) throughout storage and distribution if the microbiological safety and the storage stability of the product are to be assured. During transportation of meat from packing plants or warehouses to retail stores, control over product temperatures may be lost because of loading of warm product to refrigerated trucks or trailers, weak air flows within refrigerated vehicles, and/or the exposure of product to ambient temperatures during the delivery of consignments *(16)*. In a recent survey of the temperatures of boxed beef distributed in Canada, it was found that although warm product was sometimes loaded from packing plants to refrigerated vehicles, such meat was cooled during storage at warehouses before being forwarded to retail stores *(8)*. Moreover, there were no indications of loss of control over the temperatures of boxed beef either during its transportation or as a result of the mishandling of product deliveries to retail stores. It therefore appears that temperatures of raw meat in consignments of primal cuts delivered to retail stores are usually well controlled.

Primal cuts that will be fabricated to retail-ready product at a retail store are usually delivered as trailer loads or large consignments from loads of mixed products, often only once a week. However, increasing quantities of raw meat are being prepared as retail-ready product at central cutting facilities *(18)*. Such product is commonly delivered daily to retail stores, with at least several, and sometimes many, relatively small consignments being loaded together to, and delivered sequentially from, a refrigerated vehicle. Moreover, small consignments of meat are often similarly delivered from wholesale warehouses to restaurants. In those distribution processes, the product on refrigerated vehicles is exposed to ambient air every time the vehicle is opened for the delivery of a consignment. Progressive loss of control over product temperatures as a result of the delivery of multiple consignments from a single truck load of meat is reported to be common and is considered difficult to avoid *(1, 10, 13)*. Despite that, the risk to consumers from such losses of control over product temperatures is uncertain. Moreover, loss of control over product temperatures during multiple deliveries can be at least minimized *(6)*, while continuing concerns about meat safety seem to have prompted improvements of temperature control at other stages of beef distribution *(8)*. Therefore, to ascertain the effects of current practices, the temperatures of beef in small consignments of retail-ready product delivered to retail stores, or vacuum packaged product delivered to restaurants, were investigated.

MATERIALS AND METHODS

Collection of temperature histories

Temperature histories were collected during summer months in regions where daily maximum temperatures were mostly between 15 and 25°C, from product dispatched from two central cutting plants that supply beef to retail stores, and from two warehouses that supply beef to restaurants. The numbers of temperature histories collected and the frequencies with which they were collected differed with the different circumstances at each facility. At plant A, master packs containing oxygen enriched atmospheres *(3)* and retail cuts of beef in overwrapped trays were placed in reusable plastic crates that measured 550 × 420 × 170 mm (l × w × h). Each crate contained two master packs, one on top of the other. The crates were without lids, and the bases and walls had a latticed structure that allowed air to move around the master packs in stacked crates. Filled crates were assembled into consignments, and several consignments were loaded to each refrigerated truck for sequential delivery to designated retail stores. A temperature data logger was placed between master packs in a randomly selected crate in each of 70 consignments to one of 25 retail stores. No more than 15 loggers were placed with product on any one day, no truck contained more than three consignments with loggers, and no more than three monitored consignments were delivered to any retail store. Each logger was removed from the crate in which it had been placed when the product in the crate was removed to be placed in a display case.

At plant B, retail-ready product was prepared and placed in crates as at plant A. However, the crates were not assembled into consignments for retail stores, but were dispatched in batches to a refrigerated warehouse where consignments for retail stores were assembled from crates of product picked from the batches. A logger was placed in each of 65 crates selected at random at the times that batches of crates were loaded to refrigerated trucks at plant B. Each crate with a logger was labeled so that it could be assigned to an appropriate consignment at the refrigerated warehouse. No more than 10 loggers were placed with product on any one day. At the refrigerated warehouse, each crate with a logger was consigned to one of 25 retail stores. No truck delivering consignments to retail stores contained more than three consignments with loggers, and no more than four monitored consignments were delivered to any retail store.

At warehouse C, boxes of vacuum packaged beef primal cuts were assembled into consignments that were loaded to refrigerated trucks for sequential delivery to restaurants. A logger was placed with each of 30 boxes of product at the times that boxes were selected for inclusion in consignments. No more than six loggers were placed with product on any day, and each box containing a log-

TABLE 1. The numbers and durations of the temperature histories obtained from consignments of beef dispatched from central cutting plants to retail stores, or from wholesale warehouses to restaurants

Facility	No. of histories	Durations of histories (h)			
		Mean	Median	Min.	Max.
Plant A	70	21	15	3	209
Plant B	65	37	25	20	168
Warehouse C	30	26	19	1	92
Warehouse D	75	1	<1	<1	4

ger was placed with a different consignment. Three consignments with loggers were delivered to each of 10 restaurants.

At warehouse D, boxes were packed with various chilled and frozen meats and assembled in consignments, as required by customers. Individual boxes within consignments could contain more than one type of product. A logger was placed in a box that contained at least one vacuum packaged, chilled beef primal cut, in each of 75 consignments to one of 25 restaurants, at the times that consignments were being loaded to refrigerated trucks. No more than 10 loggers were placed with product on any one day, no truck contained more than three consignments with loggers, and no more than three monitored consignments were delivered to any restaurant.

Product from plant A and warehouse D were monitored using HOBO® H8 temperature loggers (Onset Computer Corp., Bourne, MA, USA), which have an accuracy of ± 0.7°C and a resolution of 0.4°C. Product from plant B and warehouse C were monitored using Sapac TempRecord™ temperature loggers (Argus Distributers (NZ) Ltd, Auckland, New Zealand), which have an accuracy of ±0.5°C and a resolution of 0.02°C. All loggers were set to record temperatures at 15 min intervals.

Analysis of data

Each temperature record was examined to determine the times at which the recording of product temperatures started and ended, the product temperature history being preceeded and followed, respectively, by a rapid decrease from and an increase to temperatures above 10°C. The general form, the initial, final, minimum, maximum and mean temperatures, and the duration of each temperature history were noted.

Temperature histories were integrated with respect to models that describe the dependencies on temperature of the growth of *Escherichia coli*, *Listeria monocytogenes* and leuconostocs. All the models were of the form $y = (bx + c)^2$, where y is the growth rate expressed as generations/h, x is the temperature in °C, b and c are constants.

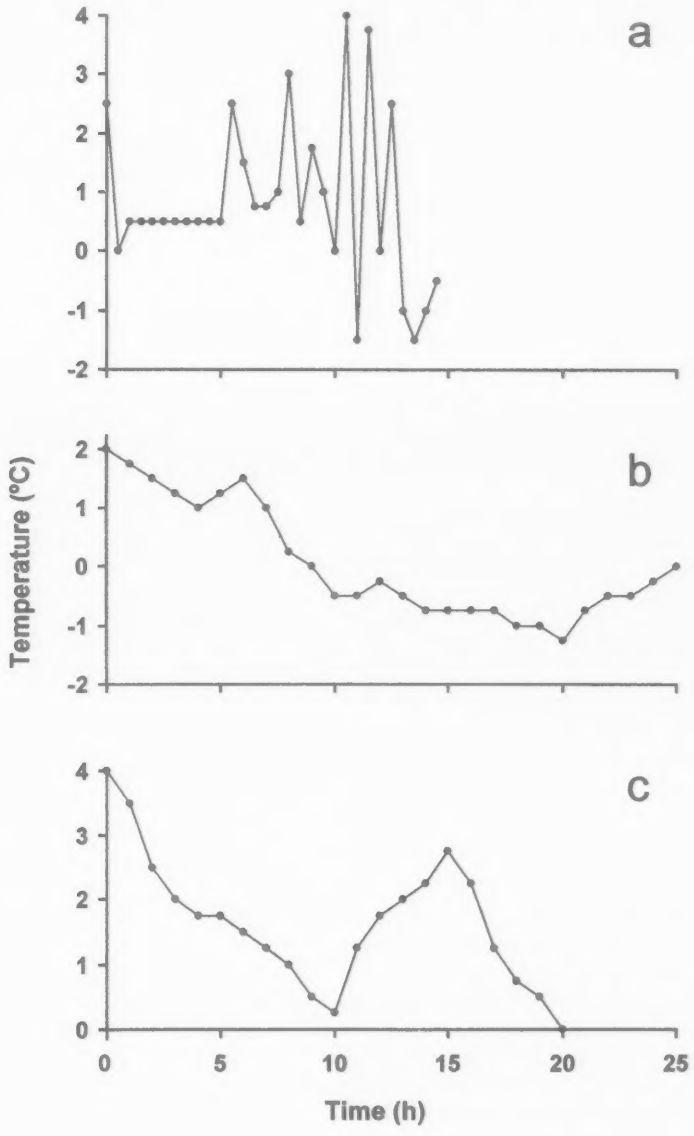
Each temperature history obtained from retail-ready product was integrated with respect to a model that describes the dependency on temperature of the aerobic growth of *E. coli (7)*. The model was: $y = (0.0513 \times -0.17)^2$ when x is between 7 and 30; and $y = 0$ when x is < 7. Each temperature history obtained from vacuum-packaged product was integrated with respect to a model that describes the dependency on temperature of the anaerobic growth of *E. coli (17)*. The model was: $y = (0.0433x -0.15)^2$ when x is between 7 and 30, and $y = 0$ when x is < 7.

All temperature histories were integrated with respect to a model that describes the dependency on temperature of the aerobic growth of *L. monocytogenes (6)*. The model was: $y = (0.033 x + 0.076)^2$ when x is between -1 and 35, and $y = 0$ when x is < -1. All temperature histories were also integrated with respect to a model that describes the dependency on temperature of the growth of presumptive leuconostocs isolated from spoiled beef *(6)*. The model was: $y = (0.026 x + 0.141)^2$ when x is between -2 and 30; and $y = 0$ when x is < -2. In addition, a storage efficiency factor was calculated for each temperature history from its duration and the calculated proliferation of leuconostocs. The storage efficiency is the percent ratio of the duration of the temperature history to the time calculated to be required for the calculated proliferation of leuconostocs to occur at -1.5°C *(4)*.

RESULTS

The shortest temperature histories were obtained for product from warehouse D (Table 1), with 96% of those histories being < 2 h long.

Figure 1. Temperature histories of the forms typical of (a) most temperature histories from product from plants A and B; (b) 26 and 63% of temperature histories from product from plant B and warehouse C, respectively; and (c) 37% of temperature histories from product from warehouse C.



Only one other temperature history, for product from warehouse C, was of a similarly short duration. Otherwise, 73% of the temperature histories for product from warehouse C were in the range 10 to 30 h. The temperature histories for product from plant A tended to be shorter, with 86% being < 20 h long; but the temperature histories for product from plant B tended to be longer, with 75% being in the range 20 to 40 h. Temperature histories longer than 20, 30 or 40 h for product from plant A, warehouse C or plant B, respectively, were from consignments that were stored for more or less lengthy times after their delivery to a retail store or restaurant.

For product from plants A and B, and from warehouse C, the initial temperatures that were recorded were all in the range 2 ± 2°C, while the final temperatures recorded for most of that product were in the range 0 ± 2°C. In contrast, the initial temperatures recorded for product from warehouse D ranged from −10 to 11°C. However, in many of the temperature histories for product from warehouse D, the final temperature was less than the initial temperature.

For product from plant A, the maximum and minimum temperatures were generally not the initial or final temperatures of a temperature history, as excursions of several degrees to sharp peaks or troughs were frequent in most histories (Fig. 1). For product from plant B, the initial was the maximum temperature in 26% of the temperature histories. In such histories, the temperature generally declined progressively until shortly before the end, when some increase in temperature usually occurred. Other temperature histories were similar to those obtained for product from plant A. For product from warehouse C, the initial was the maximum temperature in 63% of the temperature histories. In those histories, as in the similar histories from plant B, the temperatures declined until near the end, when temperatures generally increased relatively rapidly. Other temperature histories for product from warehouse C each typically exhibited a single broad peak, when temperatures rose to a maximum value shortly after the start or shortly before the end of the history. In contrast, the temperature histories for product from warehouse D showed no peaks or troughs. Instead, the temperatures either varied little or, in 64% of the histories, declined progressively by 1 or 2°C from the initial, maximum temperature.

TABLE 2. The distributions of the mean, minimum and maximum temperatures of temperature histories obtained from consignments of beef dispatched from central cutting plants to retail stores, or from wholesale warehouses to restaurants

Facility	Temperatures (°C)											
	Means				Minima				Maxima			
	Mean	Median	Min.	Max.	Mean	Median	Min.	Max.	Mean	Median	Min.	Max.
Plant A	1.6	1.5	-0.7	6.8	-0.7	-0.6	-5.8	3.3	5.5	5.8	1.2	15.6
Plant B	0.7	0.6	-0.5	3.5	-0.7	-0.6	-3.3	1.4	3.8	3.2	0.4	12.9
Warehouse C	0.5	0.4	-2.2	2.5	-1.2	-1.5	-5.3	2.1	3.1	2.4	0.3	7.4
Warehouse D	3.8	3.8	-10.6	11.4	3.3	2.9	-11.1	11.4	4.1	4.2	-10.0	11.4

TABLE 3. The numbers and distribution of proliferation values for of *Escherichia coli* and *Listeria monocytogenes* calculated from temperature histories obtained from consignments of beef dispatched from central cutting plants to retail stores, or from wholesale warehouses to restaurants

Facility	*E. coli*					*L. monocytogenes*				
	No. of values	Proliferation (generations)				No. of values	Proliferation (generations)			
		Mean	Median	Min.	Max		Mean	Median	Min.	Max.
Plant A	17	0.08	0.03	0.01	0.45	70	0.36	0.26	0.02	3.18
Plant B	4	0.10	-	0.02	0.17	65	0.43	0.20	0.10	1.76
Warehouse C	1	0.09	-	-	-	30	0.33	0.23	0.01	1.81
Warehouse D	18	0.01	0.01	<0.01	0.04	72	0.03	0.01	< 0.01	0.19

For the temperature histories of product from plant B, 97% of the minimum temperatures were < 1°C, 95% of the mean temperatures were < 2°C, and 92% of the maximum temperatures were < 7°C (Table 2). The temperature histories of product from warehouse C were similar in that 90% of the minimum temperatures were < 1°C, 83% of the mean temperatures were < 2°C, and 97% of the maximum temperatures were < 7°C. The temperatures of product from plant A tended to be higher. For the temperature histories of that product, 97% of the minimum temperatures were < 2°C, 96% of the mean temperatures were < 4°C, and 76% of the maximum temperatures were < 7°C. The temperatures of much of the product from warehouse C were higher again, as temperature histories of that product showed that 37, 44 and 55% of the minimum, mean and maximum temperatures, respectively, were ≥ 4°C, and 19, 20 and 24% of those temperatures, respectively, were ≥ 7°C.

Only minorities of the consignments from all facilities experienced temperatures that would permit the growth of *E. coli*, and the product was at such temperatures for only short times. Consequently, the proliferations calculated for *E. coli* were mostly < 0.1 generation, and all were < 0.5 generation (Table 3). In contrast, with the exception of three consignments from warehouse D, all consignments from all facilities experienced temperatures that would allow the growth of *L. monocytogenes*. The exceptions were consignments from which all the temperatures recorded were < -5°C. However, the *L. monocytogenes* proliferations calculated for most of the temperature histories were < 1 generation. Of the 13 temperature histories for which proliferations >1 generation were calculated, all but one were > 40 h and some were > 100 h long. The exception was a temperature history for product from plant A with a duration of 14 h and a mean temperature of 6.8°C.

With the exception of the three consignments from warehouse D, which experienced only freezing

TABLE 4. The distributions of values for the proliferations of leuconostocs and for the storage efficiencies calculated from the temperature histories obtained from consignments of beef dispatched from central cutting plants to retail stores, or from wholesale warehouse to restaurants

Facility	Proliferation (generations)				Storage efficiency (%)			
	Mean	Median	Min.	Max.	Mean	Median	Min.	Max.
Plant A	0.63	0.47	0.01	5.36	32	27	8	89
Plant B	0.96	0.74	0.41	3.50	40	41	17	78
Warehouse C	0.70	0.54	0.08	2.76	55	41	20	247[a]
Warehouse D	0.04	0.02	< 0.01	0.23	34	32	6	93

[a] Storage efficiency exceeds 100% when temperatures in a history are < -2°C some of the time.

temperature, all temperatures histories would have allowed the growth of leuconostocs. The proliferations of leuconostocs calculated for most temperature histories were < 1 generation (Table 4). Proliferations > 1 generation were calculated for temperature histories mostly > 40 h long, for 23, 16 and 11% of the temperature histories for product from plant B, warehouse C and plant A, respectively. A wide range of storage efficiencies was calculated for the consignments from each facility. However, for consignments from plants A and B, 64% and 69% of the storage efficiencies, respectively, were within ± 10% of the mean storage efficiency for consignment from the plant, and only 4% and 12% of the storage efficiencies, respectively, were of lesser value. In contrast, for consignments from warehouses C and D, only 30% and 24% of the storage efficiencies, respectively, were within ± 10% of the mean storage efficiency for consignments from the warehouse, and for consignment from both warehouses, 37% of the storage efficiencies were of lesser values.

DISCUSSION

The four distribution systems differed with respect to the containers used for product, the temperatures of product at the times of dispatch, and the times in transit. However, despite those considerable differences, the temperatures of product from all four facilities tended to decline rather than increase during distribution. The temperature histories indicate that the declining temperatures were due to product being loaded to refrigerated trucks or trailers that were operated at subzero temperatures as low as -5°C.

Although the air temperatures in refrigerated vehicles were generally low, the product would be exposed to warmer air when consignments were unloaded. The lack of peaks in temperature histories for product from warehouse D indicates that the product was exposed only briefly to ambient temperatures when truck doors were opened, whether or not the monitored product was removed. The single broad peaks in temperature histories for product from warehouse C indicate that when monitored consignments were loaded or unloaded, the product was exposed to warm temperatures for substantial times, with temperatures changing relatively slowly within the closed boxes. The multiple sharp peaks in temperature histories for product from plants A and B reflect the repeated exposure of product to warm air that entered trucks and circulated through the latticed crates when doors were open.

However, the transient increases in temperature were insufficient to allow any extensive growth of *E. coli*. Differences in bacteria numbers of 0.5 log unit or less are generally regarded as trivial *(14)*. By that criterion, proliferation less than 1.6 generations must be considered inconsequential *(15)*. In the worst case the increase in numbers of generic *E. coli* could not exceed 0.5 generation, and so increases in the numbers of related mesophilic pathogens could not be more *(2)*. It then appears that none of the distribution processes would give rise to any increased risks to consumers from organisms such as *Salmonella* or *E. coli* O157:H7.

Estimation of the possible proliferations of *L. monocytogenes* allowed by temperatures histories is indicative of increased risks that might arise from the growth of cold tolerant pathogens *(5)*. The organism grows readily on fat and high pH muscle tissue of vacuum packaged beef as well as on meat stored under aerobic conditions *(11)*, and the available data indicate that rates of growth under anaerobic conditions are similar to rates of growth in air *(6)*. Therefore, unlike with *E. coli*, the same model can be used to estimate both the aerobic and anaerobic growth of *L. monocytogenes*.

Some proliferation of cold tolerant pathogens present on meat is inevitable while the product remains unfrozen *(5)*. With a single exception, the estimated proliferation of *L. monocytogenes* did not exceed 1 generation when the temperature history was < 40 h long. As temperature histories of longer duration could arise only when product was stored at a retail store or restaurant, it appears that growth of cold tolerant pathogens was in general adequately contained during the distribution of product.

In meat packed under vacuum or modified atmosphere, the spoilage flora is dominated by psychrotrophic lactic acid bacteria *(12)*, with leuconostocs being among the most rapidly growing organisms in that group. The proliferation of leuconostocs is then indicative of the development of spoilage flora on meat in preservative packagings *(6)*. As spoilage by lactic acid bacteria would usually require a total proliferation of some 20 generations *(3)* while the estimated proliferations of leuconostocs were mostly < 1 and rarely exceeded 2 generations, it appears that the proliferation of spoilage organisms was adequately contained during the distribution of product. However, the wide ranges of storage efficiencies show that the development of spoilage floras is limited by relatively rapid distribution of product rather than by close control of product temperatures. Obviously, with most storage efficiencies being < 50%, there continue to be extensive possibilities for increasing product storage life by achievement and maintenance of temperatures for chilled meat that are near the optimum of -1.5°C *(9)*, before and after as well as during the transportation of product. Despite that, and contrary to previous reports on the distribution of multiple consignment from single loads *(1, 6, 10, 12)*, it is apparent that in all four of the processes, control of product temperatures tended to improve rather then degrade during the sequential deliveries of consignments of retail-ready or vacuum packaged beef to retail stores or restaurants.

CONCLUSIONS

Operation of vehicle refrigeration equipment at sub-zero temperatures and appropriate handling of product during delivery can, and in commercial practice does, assure that control over product temperatures is not lost when multiple consignments of chilled meat are delivered sequentially from single loads in refrigerated vehicles.

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An Outline of the History of Milk Inspection

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With the appointment of the first milk inspector, milk inspection took on special significance in the affairs of those interested in our health and welfare. We are not sure when the first milk inspector was appointed or where. We do know that in 1911, a group of them met in Milwaukee and organized the "International Association of Dairy and Milk Inspectors."

From that time until the year 2000, milk was singled out from other foods as the organization's name was updated six times to clarify the changing objectives of the organization. In 2000, the name became "The International Association for Food Protection." That almost ninety years indicates the importance of milk and milk inspection to those interested in our health and welfare as affected by our food supply.

The question arises, "Why did milk and milk inspection play such a prominent part in the affairs of those interested in the protection of our food, environment, and general health, to give it such respect and attention?"

Having had the opportunity to play a significant part and, I hope, having made a number of contributions during the years I was privileged to participate in the regulation of the milk and dairy industry, including the enforcement of sanitary practices, it gives me pleasure to reflect on that experience. Going back to the spring of 1936, when I became associated with the St. Louis District Dairy Commission and the St. Louis Health Department as a Sanitary Engineer, followed by service in the state of Michigan, and finally in Kansas City until the time I left following World War II, dramatic change and progress took place in both the program and its application, for the betterment, I am sure, of the industry and of the health and welfare of our nation.

It was my experience to have the opportunity to meet and work with the problems and people who originated the various milk programs and inspection procedures that have worked so well, not only in the area of milk, but also in general sanitation.

We must all be aware that we are dependent upon the availability of water, air, food, and a good environment for civilization to exist and continue to grow. Water and milk affect us directly and have an important impact on our health. Without a safe milk supply, life as we know it would not be possible.

The milk of the mother who gives birth and a start to life, supplemented with the help of the bovine species, has given us the opportunity to reach a level of life expectancy for which we should be thankful. Those people and animals that contribute so much deserve our appreciation and respect.

When our nation's lifestyle and economy moved into the industrial age following the Civil War, interest in milk began to change and intensified during the latter part of the 19th century and the earlier part of the 20th. The family moved from being self-sufficient to becoming dependent upon others. Among the changes was the departure of the family cow, the source of milk for most families. When they began to depend on outside sources for milk, the picture began to change and problems arose.

We owe much to members of the medical profession during those changing years and to their ability to recognize the importance of milk on our health and welfare. The collection of information and statistics by them indicated that a problem presented itself when children moved from breast milk to the use of cow's milk. These facts and phenomena prompted the medical

profession to take a prominent part in ensuring the safety and quality of milk and dairy products.

Cities employed milk inspectors and set up programs supported by the medical profession. Accordingly, in 1911, the first organization of milk inspectors, the International Association of Dairy and Milk Inspectors, was established.

With the influence of the medical profession, the United States Public Health Service was enlisted as a factor in the supervision of not only milk and water, but also other food products in interstate commerce. During this period, from 1911 until approximately the early 1920s, ideas relating to the steps necessary to establish a program and ensure compliance varied from community to community and from individual to individual, creating a lack of uniformity and purpose.

In the early 1920s, the medical profession established its own Medical Milk Commissions, whose members established, in the metropolitan areas, provisions for Certified Milk and provided, to the best of their knowledge, rules and regulations regarding the safety and quality of milk. Much of this milk was raw, and some was pasteurized as pasteurization was accepted as a means of insuring the safety of the milk supply as a result of the work of Louis Pasteur. The pasteurization process, however, lacked precision and control of temperature and time, resulting in a product that lacked uniformity in taste and flavor and did not always gain consumer acceptance.

In areas, especially those where certified milk was available, the infant death rate declined, and credit for this decline was given to inspections set up by the medical society. However, outlying communities, little or no progress was made, and in fact the situation continued to deteriorate.

During the Hoover administration (1929-1933), Herbert Hoover convened a White House conference on child health. The outcome of this conference was a call for improvement in the nation's milk supply and the development of a program and rating system leading to an ordinance and regulations to ensure the safety and quality of the milk supply, together with an improvement in general sanitation within the home and the community.

The responsibility for this program was placed with the United States Public Health Service, which established a Milk Commission to survey the situation and come up with a program that could be offered to local communities. Ordinances and a compliance program were to be developed, with the pressing need to decrease the infant death rate and improve public health.

The Public Health Service assembled an elite group of specialists consisting of veterinarians, dairy-trained specialists, bacteriologist, and engineers to survey and put in place a program to correct the problem. The outcome was the United States Public Health Services Milk Program.

It made available for passage as a local ordinance a program supported by the United States Public Health Service. The program included provisions for farm and processing plant compliance, as well as regulation of distribution to the ultimate consumer. It provided for grading and labeling and as can be seen in retrospect, provided for the protection of the consumer from cow to table.

Needless to say, this program generated opposition, however it did correct some of the troubling practices that had been uncovered by the Commission's survey.

The program was initially aimed at smaller communities and attracted attention as it began to produce successful results in the form of noted improvements in safety and quality of milk supplies.

Also at this time, responding to the interest of consumers in the programs, many progressive dairymen, such as the Kerckhoffs at Pevely Dairy in St. Louis, Bowman's Dairy in Chicago, Bordens and many others throughout the nation, were taking steps to ensure that milk was properly produced, pasteurized, packaged, and delivered to the consumer. The program provided for a system of surveying local communities and matching the results against a rating system designed to ensure a safe milk supply. A rating of 90 or better was assumed to indicate that reasonable compliance existed.

What was this program?

The program was a plan, thoughtfully conceived, logically arrived at, and carefully reviewed, to accomplish the goal of establishing that milk supplies for communities were safe and of good quality. First, it provided a legal document, in the form of an ordinance carrying all of the legal terminology to provide for the requirements of accomplishing the goal. Second, it provided public health reasons for each step taken, to afford a sound basis for the requirements. Third, accompanying the ordinance and the public health reasons was a document, The Code, that contained satisfactory compliance provision.

Thus a program was made available, agreed upon by a panel of qualified people, to provide a milk supply that was, above all, safe and of good quality, from the cow and point of production to

the point of consumption. In its details, however, it contained gray areas in which existing conditions could be met where they could be justified by public health reasons.

Local communities were encouraged to set up local inspection facilities for the necessary laboratory work, inspections, and reporting activities. Enforcement was achieved through the awarding of grades.

States were encouraged to employ specialists to work with communities to install these programs and put them into effect.

With regard to the grading provisions, states were encouraged to rate periodically the various milk supplies under their jurisdiction. In addition, the Public Health Service itself would periodically do the same. Thus a system was in effect to provide a program, provisions for its application, and the ability to evaluate its success or failure. At set intervals, public reviews were conducted to evaluate and recognize the changes and new developments occurring in the technology of the dairy industry. Where changes were noted, recommendations to that effect were passed on to the states, and eventually to the local communities. During that time, rapid advancements were being made, especially in pasteurization, from a method using a long-term (thirty minute) holding time to the short-time high temperature method.

Controls for heating and controlling temperatures of heating and cooling media, as well as milk itself, were becoming extremely precise, and it was possible to process quality milk under carefully controlled conditions and maintain the uniformity of taste and flavors that assured consumers products that met their approval. In addition, the program carried with it a resounding support of the importance of milk in the human diet, not only for children, but for adults as well. With a supply that could be relied upon, health officials had no hesitation giving their endorsement.

What had happened?

The program, originally intended for the small and medium community to improve their milk supply, attracted the attention of health officers in our larger cities. Health Commissioner of Chicago, Dr. Bundensen, was the first to request a survey and a proposal for the passage of the United States Public Health Services Milk Program in that city. This prompted the interest of Dr. Bredeck, the Health Commissioner of St. Louis, who shortly afterward, with the help of local community leaders, prevailed upon the city of St. Louis to adopt the United States Public Health Services program. In addition, several years later, the city of Kansas City, under the direction of Dr. Hugh Dwyer, a veterinarian as well as a medical doctor, adopted the United States Public Health Services milk program. In both Chicago and St. Louis, pasteurization was made mandatory. In Kansas City, provisions still permitted raw milk.

With these three major communities and the service areas of the dairies within their jurisdiction serving the smaller satellite communities, the necessity for milk ordinances in small communities began to diminish. This brings us up to today, when multi-national organizations produce, process, and distribute milk throughout the entire United States. To answer our question, we recognize that consumption of fluid milk is essential and universal.

The contribution of those involved in milk inspection in creating a favorable environment for compliance with the necessary regulations and acceptance by a progressive, far-sighted dairy industry has assured the consuming public of a safe milk supply in which they could have the same degree of confidence that they have in their water supply.

Eternal vigilance is the price of a safe milk supply. Continued attention to quality and safety makes a difference. With that in mind, the many checks and balances that have been established for the various responsibilities has kept interest in milk at the forefront of public health considerations and discussions. Because of the many issues and different forces at work impacting not only on the dairy industry but on our entire economy and lifestyle, the rating system in effect represents both consumer protection and a guide for industrial success.

Nothing is so serious as a milk-associated disease outbreak that could have been prevented through proper practices, procedures, and supervision. Thus all of us involved, working together, have an obligation to see to it that the basic fundamental standards that have been established, and that work, are carried out.

To sum it up, one consumer interest and demand, and two, a program clearly defined with the necessary checks and balances, are the reasons safe, wholesome milk has stayed in the forefront.

As a side note, the number of milk inspectors and the total cost of milk inspection have diminished over time. The lessons learned have carried over into other aspects of public health work and the program established for milk inspection have provided the basis for many other public health programs.

CALL FOR SYMPOSIA

IAFP 2003

AUGUST 10–13, 2003

NEW ORLEANS, LOUISIANA

The Program Committee invites International Association for Food Protection Members and other interested individuals to submit a symposium proposal for presentation during the 2003 Annual Meeting, August 10-13, 2003 in New Orleans, Louisiana.

WHAT IS A SYMPOSIUM?

A symposium is an organized, half-day session emphasizing a central theme relating to food safety and usually consists of six 30-minute presentations by each presenter. It may be a discussion emphasizing a scientific aspect of a common food safety and quality topic, issues of general interest relating to food safety and quality, a report of recent developments, an update of state-of-the-art materials, or a discussion of results of basic research in a given area. The material covered should include current work and the newest findings. Symposia will be evaluated by the Program Committee for relevance to current science and to Association Members.

SUBMISSION GUIDELINES

To submit a symposium, complete the Symposium Proposal form in its entirety. When submitting a proposal, the presenters do not need to be confirmed, only identified. Confirmation of presenters takes place after acceptance of your symposium.

SYMPOSIUM FORMAT

Symposium sessions are 3 and 1/2 hours in length including a 30-minute break. A typical format is six 30-minute presentations. However, variations are permitted as long as the changes fit within the allotted time frame. If varying from the standard format, be sure to indicate this on the Symposium Proposal form.

SYMPOSIUM PROPOSAL DEADLINE

Proposals may be submitted by mail to the International Association for Food Protection office for receipt no later than June 14, 2002 or by presenting the proposal to the Program Committee at its meeting on Sunday, June 30, 2002 in San Diego, California. Proposals may be prepared by individuals, committees, or professional development groups.

The Program Committee will review submitted symposia and organizers will be notified in August 2002 as to the disposition of their proposal.

PRESENTERS WHO ARE NOT MEMBERS

International Association for Food Protection does not reimburse invited presenters for travel, hotel, or other expenses incurred during the Annual Meeting. However, invited presenters who are not Association members will receive a complimentary registration. Presenters who are Association Members are expected to pay normal registration fees.

ASSOCIATION FOUNDATION SPONSORSHIP

The International Association for Food Protection Foundation has limited funds for travel sponsorship of presenters. After formal acceptance of the symposium, symposia organizers may make requests in writing to the Program Committee Chairperson. Requests are reviewed on an individual and first-come-first-served basis. The maximum funding grant will be $500 per symposium. Organizers are welcome to seek funding from other sources and the Association will provide recognition for these groups in our program materials. Organizers are asked to inform the Association if they obtain outside funding.

HAVE AN IDEA BUT YOU ARE UNABLE TO ORGANIZE IT?

Many Association Members have excellent suggestions for symposia topics, but are unable to organize the session. Such ideas are extremely valuable and are welcome. If you have an idea for a symposium topic, please inform the IAFP office as soon as possible. Symposia topics are among the most valuable contribution an Association Member can make to enhance the quality of our Annual Meeting.

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Fax: 515.276.8655
E-mail: bcorron@foodprotection.org

SYMPOSIUM PROPOSAL

IAFP 2003

AUGUST 10–13, 2003

NEW ORLEANS, LOUISIANA

Title: _____

Organizer's Name: _____

Address: _____

Phone: _____ Fax: _____ E-mail: _____

Topic – Suggested Presenter, Affiliation

(Example: 1. HACCP Implementation – John Smith, University of Georgia)

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

Suggested Convenors:

_____

_____

Description of Audience: _____

Signature of Organizer: _____

Submit by mail
by June 14, 2002 to:

International Association for Food Protection
Symposium Proposal
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322-2864, USA

Submit in person
on June 30, 2002 to:

Program Committee Meeting
IAFP 2002, the Association's 89th Annual Meeting
San Diego, California

or Contact:

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Highlights of the Executive Board Meeting

May 5-6, 2002

Following is an unofficial summary of actions from the Executive Board Meeting held May 5 and 6, 2002 in Des Moines, Iowa:

Approved the following:

- Minutes of January 20, 2002 Executive Board Meeting
- Minutes of January 20, 2002 Executive Session Board Meeting
- E-mail votes taken since the January 20, 2002 Executive Board Meeting
- Affiliate Charter for Brazil Association for Food Protection pending proof of five IAFP Members belonging to the new Affiliate
- Proposed plan to address non-compliant Affiliates
- Certificate of Merit for Larry Mendes from the Ontario Food Protection Association
- Disband the HACCP Task Force as their current assignment has been completed
- Budget for FYE August 31, 2003 including increases in advertising rates, dues, subscriptions, and Annual Meeting registration
- Establishing a Safe Harbor 401(k) plan for IAFP employees

Discussed the following:

- Discussed *DFES* manuscript status and how to re-establish *Thoughts on Food Safety* subcommittee. Discussed pros and cons of name change for *DFES*
- *JFP* continues to publish articles timely. *JFP* Online now available
- Membership Update: Membership continues steady. Expanded new Member retention efforts discussed. Online renewal now available
- Advertising Update: Ad sales continue strong
- Financial Update: March financial statements reviewed and compared to budget
- Spring Affiliate Newsletter mailed in April and is available online
- IAFP Officers made presentations to four Affiliate organizations this spring. Six are scheduled for fall meetings
- Affiliate Award restructuring and recommended discontinuing the Membership Achievement Award
- Potential new Affiliate organizations
- Michigan invitation to host the Annual Meeting
- Affiliate Educational Session — "Developing Future Affiliate Leaders"
- International Food Safety Icons being developed by the Retail Food Safety and Quality PDG
- Request for HACCP inspection of Annual Meeting host hotels
- New Committee Member and Chairpersons' appointments
- Teller's report conveying Jeff Farber elected as Secretary for 2002-2003
- Student PDG Newsletter from April 2002
- Revising criteria and jury evaluation forms for the Black Pearl and Fellow Awards
- International Leadership Award Update
- Planning for IAFP 2002 — tours and social events
- Exhibit Hall 94% sold, sponsorship commitments exceed last year
- Four workshops presented with IAFP 2002
- Future Annual Meeting site selection and scheduling problems
- IAFP on the Road — USDA/FSIS — Thinking Globally — Working Locally, Conference on Food Safety Education, September 18-20, 2002 and Food Safety Summit, March 2003
- Organizing session(s) for Food Safety Summit
- Long Range Planning updated
- Corporate Challenge update
- World Health Organization Non-Governmental Organization
- 3-A Sanitary Standards, Inc. — update given
- Reprinting of IAFP History Books
- European Association Services offered
- Honorary Life Membership for Warren Clark
- Food Safety and Food Security Center

Next Executive Board meeting: San Diego, California, June 28 – July 4, 2002

Jeffrey M. Farber
Elected IAFP Secretary

The International Association for Food Protection welcomes Dr. Jeffrey M. Farber to the Executive Board as Secretary. Dr. Farber will take office at the conclusion of the Awards Banquet at IAFP 2002, the Association's 89th Annual Meeting in San Diego, California. By accepting this position, he made a five-year commitment to the Association and will begin his term as President in the summer of 2005.

Dr. Farber is currently Director of the Bureau of Microbial Hazards, for the Food Directorate of Health Canada, where he is responsible for the management of research and policy development in the area of microbiological food safety. Prior to assuming the Director's position, Dr. Farber was a Research Scientist in the Bureau of Microbial Hazards for 17 years after completing an NSERC post-doctoral fellowship at Health Canada in 1983. He became Acting Chief of the Microbiology Research Division in 1998, and Associate Director in 2000.

During his 19-year career, Dr. Farber has published over 100 papers in refereed journals, six book chapters, edited two books, has been, and continues to be an invited lecturer on food microbiology and food safety, internationally. His main areas of expertise are *Listeria monocytogenes*, modified atmosphere packaging, fresh-cut produce, *Enterobacter sakazakii*, and molecular typing of foodborne pathogens. He currently also holds International Life Sciences Institute (ILSI) and Biotechnology grants for work on the virulence, molecular typing and biochip detection of *L. monocytogenes* in foods. In 1999, Dr. Farber was awarded the Seafood Technology Division, Divisional Lecturer award and also received two Food Directorate Team Awards in 2001.

Since joining the International Association for Food Protection (IAFP) in 1986, Dr. Farber served on the Program Committee for close to six years, the last year of which he was the Chairperson. Dr. Farber has also given many invited talks, as well as organized numerous symposia at the IAFP Annual Meetings, and has been involved with a number of the Professional Development Groups (PDGs). He has also been a member of the Nominating Committee, Chairperson of the Developing Scientist Award Committee, and actually started the very successful Fruit and Vegetable Safety and Quality PDG, of which he is still a member.

Dr. Farber is currently a member and Treasurer of the International Commission on Microbiological Specifications for Foods (ICMSF). In terms of editorial work, Dr. Farber is currently the Editor of the *International Journal of Food Microbiology* and on the Editorial Board of the *Journal of Food Protection* and the *Italian Journal of Food Science*, as well as being on the *Journal of Food Protection* Management Committee. He has served on Expert Committees for the WHO, FAO and IFT, as well as Scientific and Technical Panels for recent IFT Task Force efforts.

Locally, Dr. Farber has been an Adjunct Professor of Microbiology at the University of Ottawa since 1992, and currently supervises two graduate students.

Dr. Farber obtained his B.Sc. and M.Sc.(A) degrees in Applied Microbiology and Immunology from McGill University in Montreal and his Ph.D. from Food Microbiology, McGill University in Ste. Anne de Bellevue, Quebec.

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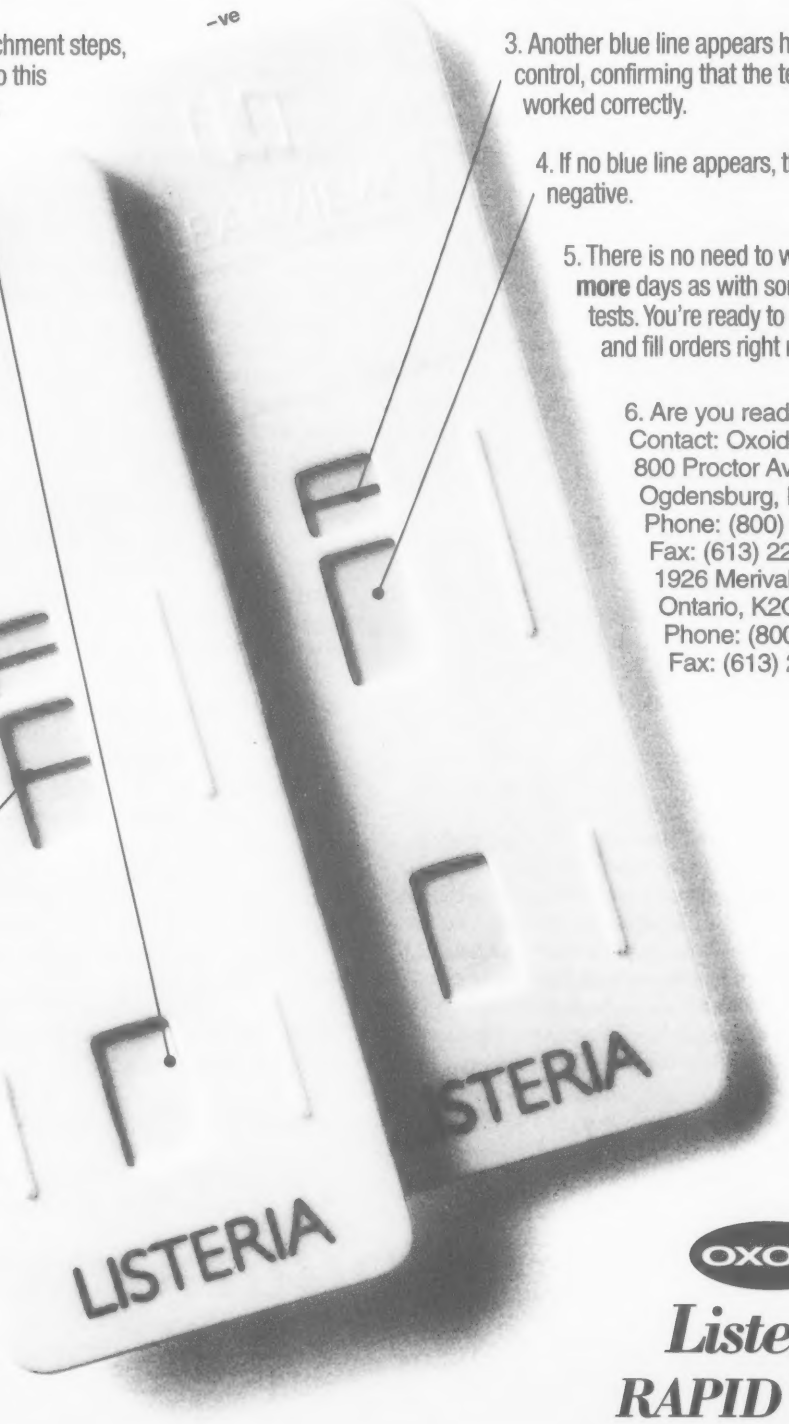

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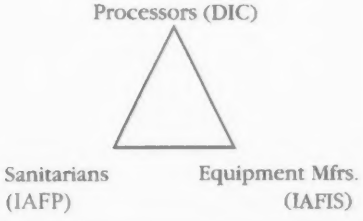
MARK OF COMPLIANCE

The 3-A Symbol Story

The 3-A Sanitary Standards Symbol Administrative Council, known throughout the industry as the "**3-A Symbol Council**," was organized in 1956. Its purpose is to grant authorization to use the **3-A Symbol** on equipment that meets 3-A Sanitary Standards for design and fabrication.



A Modern Concept

The modern concept of the 3-A program was established in 1944 when the Dairy Industry Committee (DIC) was formed. DIC is one of the three industry segments involved in the preparation of 3-A Sanitary Standards. These industry segments are:

- **Processors,** represented by DIC
- **Equipment Manufacturers**, represented by IAFIS
- **Sanitarians**, represented by IAFP

Use of the Symbol

Voluntary use of the **3-A Symbol** on dairy equipment:

- assures processors that equipment meets sanitary standards
- provides accepted criteria to equipment manufacturers for sanitary design & fabrication
- establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A Sanitary Standards Symbol Administrative Council

1500 Second Avenue S.E., Suite 209

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Web site: http://zeus.ia.net/~aaasansb

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Your support is vital to the growth and continuing success of the Foundation. Please send your contributions to the Association office today.

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UpDates

Former USDA Official Eileen Kennedy Named ILSI Global Executive Director

Dr. Eileen Kennedy has been named the new ILSI Global Executive Director for the International Life Sciences Institute (ILSI). Dr. Kennedy, former acting undersecretary of research, education, and economics at the U.S. Department of Agriculture, assumed her position on March 18, 2002. In announcing the appointment, Dr. James Stanley, president of ILSI, cited Dr. Kennedy's many qualifications, among them her grasp of the scientific issues of interest to ILSI, strong managerial skills, and international experience with nutrition and food security.

Dr. Kennedy held positions at the United States Department of Agriculture (USDA) from 1979 to 1981 and from 1994 to 2001, she served as chief of the nutrition policy branch in the food and nutrition service; executive director of the USDA Center for Nutrition Policy and Promotion; and deputy undersecretary of research, education, and economics. In the 1980s and 1990s, she designed and supervised programs on food security and nutrition in Africa, Asia, and Latin America for the International Food Policy Research Institute, in Washington, D.C. Throughout her professional career, Dr. Kennedy has held adjunct academic appointments at Tufts University, Harvard University, Cornell University, and Johns Hopkins University.

A graduate of Hunter College in New York City, Dr. Kennedy earned master's degrees in nutrition from the Harvard School of Public Health and the Pennsylvania State University School of Public Health, and earned a doctor of science degree in nutrition from the Harvard School of Public Health.

Dr. Bugbee Appointed Vice President, Technical & Development Services at the National Registry of Food Safety Professionals

The National Registry of Food Safety Professionals recently announced the appointment of Dr. Alan C. Bugbee, Jr. to the newly created position of vice president, technical and development services. As in-house psychometrician, one of his areas of responsibility includes all tasks associated with test development, measurement and computerized testing.

Most recently a psychometric consultant to various government, public and private clients, Dr. Bugbee brings more than 22 years of extensive experience in strategic design, program development, research, and administration. Dr. Bugbee serves as a psychometric consultant for the American Board of Nursing Specialties and the AARP Foundation. He also serves with a number of professional organizations, particularly in examination standards, certification and professional publications.

Dr. Bugbee holds a Ph.D. in educational research methodology from the University of Pittsburgh. In addition, he holds a masters of public administration and a masters of arts in education in rehabilitation counseling.

Rheometric Scientific Appoints New Member to Board of Directors

Rheometric Scientific announced that it has elected Paul Woitach to its Board of Directors on February 4, 2002.

He is a seasoned and innovative executive with management, marketing and turnaround experience in diverse technology industries including medical products, pharmaceuticals, personal care and laboratory instruments. Mr. Woitach's management expertise and analytical instrument experience in life science industries will be of great value to the Rheometric Scientific, Inc. Board of Directors.

Mr. Woitach received both his BA and MBA from the University of Rochester where he graduated cum laude. Mr. Woitach has held executive level positions, up to and including president and chief executive officer, at several corporations.

Chr. Hansen Appoints Tim Ault as New Plant Manager

Chr. Hansen, Inc., announces that Mr. Tim Ault has been named the new plant manager for the company's seasonings plant in Elyria, OH. In this position, he directs all manufacturing activities, including timely and cost effective production, product quality and delivery.

Mr. Ault comes to Chr. Hansen from GreenLine Produce, a producer of fresh produce, where he was plant manager. While leading their production facility in Ohio, he most recently was responsible for establishing a new facility in California, developing supply sources and cultivating potential customers.

Prior to that, Mr. Ault spent 10 years of progressive production responsibility within Frito-Lay and Nabisco organizations, gaining valuable experience in plant operations and logistics, quality control, sanitation and safety.

USDA-ARS Sr. Scientist Dr. Nelson A. Cox Wins 2002 NFPA Food Safety Award

Dr. Nelson A. Cox, Senior Scientist with the U.S. Department of Agriculture-Agricultural Research Service, is the 2002 recipient of the National Food Processors Association (NFPA) Food Safety Award in recognition of his dedication and many contributions to improving food safety. Dr. Cox will be presented the award at the annual meeting of the International Association for Food Protection, June 30–July 3, 2002 in San Diego, CA.

"Dr. Cox is renowned for his pioneering research and practical innovations to reduce *Salmonella* and *Campylobacter* contamination of commercial poultry products," said Jenny Scott, Past President of IAFP and Senior Director in the NFPA Office of Food Safety Programs. "Dr. Cox's contributions have had widespread impact both through the research and development of practical methods to control human pathogens in poultry production, as well as his teaching and innumerable presentations at scientific forums."

During nearly 30 years with the U.S. Department of Agriculture-Agricultural Research Service, Dr. Cox has been a pioneer in the field of poultry microbiology and is widely considered one of the world's leading experts in this field. Much of his work centered on reduction of *Salmonella* and touched on all phases of the poultry industry including innovative work with the hatchery and sanitation of eggs to prevent contamination of broiler chicks. Dr. Cox also pioneered more recent developments with competitive exclusion treatments using beneficial organisms to reduce *Salmonella*.

In addition to his achievements in research, Dr. Cox is widely known and respected for co-founding the Rapid Methods and Automation in Food Microbiology Workshop at Kansas State University together with Dr. Daniel Fung. Held annually since 1981, this workshop has provided unparalleled instruction through intensive practical hands-on as well as classroom lecture training to more than 2,000 microbiologists from around the world. In 1997, Dr. Cox was awarded the Kansas State University Distinguished Service Award.

Dr. Cox earned his B.S., M.S. and Ph.D. degrees from Louisiana State University. He has produced 361 refereed journal articles, conference proceedings, reports, book chapters and books as well as 153 citable abstracts. Dr. Cox holds nine patents.

International Association for Food Protection

NEWS

Institute for Scientific Information Names Marth as Highly Cited Researcher, Worldwide

Elmer H. Marth, emeritus professor of food science, bacteriology and food microbiology and toxicology at the University of Wisconsin-Madison, recently was named a highly cited researcher, worldwide, in the agricultural sciences during the last two decades. This honor was bestowed on him by the Institute for Scientific Information (ISI), Philadelphia publisher of *Current Contents*. The ISI, through use of its immense data base, has identified 111 highly cited researchers (Marth included), worldwide, in the agricultural sciences for the period of 1981 through 1999.

According to the ISI, frequency of citation is a key measure of the influence of a researcher on science and technology. The citation data became a statistically powerful resource for finding individual authors who have formed or changed the course of research in a subject.

Dr. Marth's research was in food/dairy microbiology with an emphasis on foodborne illness. A complete list of highly cited researchers in the agricultural sciences, limited biographical information for some, and the publication record since 1981 for all can be found at www.isihighlycited.com.

Canadian Food Inspection Agency Looking After Canada's Reputation

Ever since the Canadian Food Inspection Agency (CFIA) began its slaughtering campaign of 18 water buffalo imported from Denmark into British Columbia, critics have accused CFIA of over-reacting to the spectre of mad cow disease. But in today's trading world, where spectres of disease can quickly snowball into real disasters, CFIA is doing the right thing.

The CFIA explains that Denmark has been shown to have mad cow disease (also termed bovine spongiform encephalopathy, or BSE), and therefore argues that it is critical to ascertain if the Denmark-sourced buffalo are infected with BSE. If found to be BSE-free, the buffalos' 28 calves will be allowed to live.

Meanwhile, the critics including the owners of the animals – have questioned the regulatory agency's insistence on slaughtering the buffalo, which they argue are at low risk of mad cow disease. The critics note that

BSE has never been found in water buffalo, and that the buffalo in question have never been fed animal by-products linked with the spread of BSE. To bolster their argument, the critics highlight the fact that the Australian government approved buffalo imports sourced came from the same Danish herd as the BC imports. The critics' questions and the owners' disappointment are understandable.

Nevertheless, it is important to note that, for better or for worse, it is appropriate for federal governments to undertake what are seemingly unnecessary slaughtering campaigns. Why? For reasons of reputation. In today's international trade environment, a nation's animal disease reputation matters. A country cannot trade internationally without having a reputation for good regulations. This truism is evident in Britain and, most recently, Japan.

Two months ago, when James Pearson, head of the International Office of Epizootics, officially declared the United Kingdom to be free from foot and mouth disease (FMD), British agriculturalists breathed a sigh of relief. Within hours, Pearson's proclamation was labelled as the final chapter for British agriculture's year of unparalleled suffering with FMD. Pearson's announcement was also music to the ears of British veterinary regulators, who worked hard to achieve FMD-free status.

Pearson's declaration effectively signaled the regulatory green light for British cattle and beef exports to resume. But it has become evident during the last few weeks that regulatory approval is not enough. Britain still has its reputation to reckon with.

After Britain was declared FMD-free, Britain's Meat and Livestock Commission optimistically hauled samples of British meat products to food and farm exhibitions in Athens and Paris. But only weeks later, the two beef exporting firms in Britain explained that there were questions about the commercial viability of the export trade.

After its BSE and FMD woes, Britain's animal disease reputation is in disarray. Despite regulatory approval, France and others in the European Union continue to resist British beef imports. Outside of the EU, Britain's re-engagement of export markets has proved challenging as well.

With time and continued regulation, Britain's export opportunities may improve. But restoration of reputations takes time, and that is why it is worthwhile to bend over backwards to maintain one's reputation in the first place. And CFIA is doing just that in the B.C. buffalo case.

The owners of the 18 buffalo on BC are understandably upset. But CFIA must still do its job, and that includes looking after Canada's animal disease reputation.

Statement on Safety of United States Meat and Poultry

US meat and poultry is safe and getting safer every day. Stringent government oversight of meat and poultry processing, coupled with state-of-the-art food safety technologies, work together to create products that set the gold standard worldwide.

Sadly, protests like the one we have witnessed are more about politics than food safety enhancement. Research shows that consumers remain extremely confident in the safety of meat and poultry. This confidence is based on personal experience: US meat and poultry has a track record of being safe, wholesome and widely consumed sources of good nutrition.

Meat and poultry plants today are more "high tech" than they ever have been, employing technologies like steam pasteurization cabinets that pasteurize the outside of carcasses, special hot water washes, organic acid rinses, irradiation and other techniques that have made our products cleaner and safer than at any point in history.

Livestock and poultry producers are partners in the efforts to make meat and poultry safe from farm to table. These producers employ a variety of new husbandry practices that also are enhancing the health of livestock and poultry and the ultimate safety of meat and poultry. The continuous presence of USDA inspectors in meat and poultry packing plants – inspectors empowered to take action any time they observe a potential food safety problem – has helped bolster consumer confidence. No other food is regulated and inspected as aggressively as meat and poultry, and producers of these foods earn the seal of the US Department of Agriculture all day every day.

USDA microbiological data show that government and industry efforts are working. All raw meat and poultry by their very nature contain bacteria. But the presence of potentially harmful bacteria is trending downward, as are foodborne illnesses associated with meat and poultry. The facts stand in sharp contrast to the claims made by protesters today. We expect these positive food safety trends to continue and are committed to earning the trust of the more than 95 percent of Americans who eat our products with confidence every day.

Edible Food Wraps Win National Award

Edible fruit and vegetable-based food wraps have garnered a national award for an Agricultural Research Service food scientist. The editors of *Popular Science* magazine chose Tara H. McHugh's work as one of the magazine's 100 "Best of What's New" awards for 2001. Her flavorful, nutritious wraps were selected from among thousands of products and technologies reviewed for the 14th annual competition. McHugh is with the ARS Processed Foods Research Unit at the Western Regional Research Center, Albany, CA.

The unique wraps McHugh developed enhance flavors and protect freshness of foods by preventing moisture loss and by blocking oxygen that could cause unattractive browning. For example, the thin, apple-flavored wraps that McHugh made from puréed apples intensify the flavor of apple slices and keep them from discoloring and shrinking. Her wrap made of strawberries complements the flavor of banana slices while keeping them fresh. McHugh's wrap from puréed peaches might be used to cover meat and then provide a tasty, attractive glaze when the meat is cooked.

In her laboratory, McHugh has made coatings of varying thickness and strength from more than a dozen fruits and vegetables. They include apricots, guavas, mangos, papayas, broccoli and carrots. The edible wraps will increase the nutrition options for consumers and will reduce the amount of plastic food wrap that ends up in landfills, according to McHugh.

Today, nearly 2 million tons of food packaging material end up as waste, according to the US Environmental Protection Agency. McHugh makes the wraps using casting or extrusion processing methods. A special section of the December 2001 issue of *Popular Science* magazine described McHugh's work and the other award-winning inventions.

Network is Canada's Comprehensive Source for Food Safety Information

The University of Guelph has formally launched the Food Safety Network, Canada's most comprehensive science-based source of information on food safety and related issues.

"Consumer concerns about food safety have increased to unprecedented levels. This network is an important bridge between science and public policy for consumers and others in the farm-to-fork food safety system around the world," said Doug Powell, a plant agriculture professor and the network's scientific director.

The network provides the most up-to-date, international research, commentary, policy evaluation and public information on food safety and safe food handling. Its features include a food safety Web site, extensive databases, field research, a comprehensive information center that will soon feature a national toll-free food safety hotline, daily news pages and listservs on evolving food safety issues, and a research and demonstration farm.

The university was able to publicly launch the network after several years and more than $570,000 in support, including $320,000 from the Donner Foundation and more than $250,000 from Guelph alumnus Dr. Ken Murray, known for his distinguished career in the Canadian meat packing industry. Such support was crucial to the establishment of the Donner Foundation Fellowship and to the development of the infrastructure necessary for the network.

"Guelph has a long and proud tradition of national leadership in innovative research focused on agriculture and food. We also have a commitment to rigorous scientific inquiry and to communicating these advances to as wide an audiences as possible. Shaping and evaluating public policy on the critical issue of food safety is a natural fit with our areas of strength," said University of Guelph President Mordechai Rozanski.

The network will work closely with the Canadian Research Institute for Food Safety, also housed at Guelph, as well as other national and international collaborators. The network will develop food safety programs and identify and assess appropriate food safety interventions. It will also use survey work and media analysis to determine public perceptions and effectiveness of food safety programs. In addition, a new graduate course in food safety risk analysis will be launched in the spring semester to help produce a new generation of science-based public policy and public education leaders.

"The Food Safety Network puts science into action. It will contribute to the development of scientific and credible food safety programs and supply a strong, science-based voice about emerging food safety issues," said Alan Wildeman, Guelph's vice-president for research.

Powell stated that the network will also help scientists and food producers understand public concerns and perceptions. "Science is not conducted in a vacuum. Researchers need to be better educated about and sensitive to public views and

questions on food safety. It is a reciprocal process," he said. The Food Safety Network provides research, commentary and public information on food safety issues from farm-to-fork.

Some of its features include:

- A Web site and database providing pertinent references and resources related to food and food safety issues, as well as links to other databases. Four listservs: the Food Safety Network (FSnet), the Agriculture Network (Agnet); Animalnet, and Functional FoodNet, covering food, medical and nutraceutical issues. The listservs assist in risk analysis activities and rapidly identify issues for risk management and communication activities.
- A research and demonstration farm that conducts research on organic, genetically-modified and traditional fruit and vegetable crops. The identification, development and assessment of appropriate food safety interventions from farm-to-fork, including the on-farm food safety programs for greenhouse and field fruits and vegetables produced in Ontario.
- Training for government, industry and academia in food safety risk assessment, management, policy and communications. Developing and evaluating food safety curricular materials for elementary and secondary schools.
- A comprehensive Information Centre that will soon feature a national toll-free food telephone line staffed by food and health professionals. Conducting public opinion surveys and assisting in the management of food recalls. Media outreach such as letters-to-the-editor, research-based press releases and weekly opinion articles distributed nationally and internationally.

Spreading the Word on Manure Food Bug Link

New guidance to help farmers eradicate food bugs from manure spread on salad, fruit and some vegetable crops is being planned by the Food Standards Agency (FSA). The draft guidance, currently out for consultation, is based on FSA-funded research into the presence and survival of bugs such as *E. coli*, *Salmonella* and *Listeria* in farm manure.

Each year around 90 million tons of solid and liquid (slurry) farm manures are applied to agricultural land used for conventional and organic farming. Some of it may contain bugs which could cause food poisoning. Crops unlikely to be cooked before being eaten, such as salads, fruits and some vegetables, are particularly vulnerable to such 'microbiological contamination.' The planned guidelines, out for consultation until June 14, 2002, were drafted by representatives from the UK agriculture departments and ones from the food and farming industries (including organic farmers). They point out a range of measures that can help kill bugs. They include: exposure to sunlight and ultra-violet rays high (above 55°C) and freezing temperatures, low acid or high alkaline soils (helped by quick lime or slaked lime to raise pH levels), the passage of time (though *E. coli* can survive in soil for several months) not allowing livestock to roam on land where crops will soon be harvested.

The draft guidance recommends a package of measures before, during and after the growing season. To find out more, read the full consultation available at www.food.gov.uk/foodindustry/Consultations/ukwideconsults/49844/.

Russian Technology May Help North American Cattle Feedlots Control *E. coli* O157:H7

A simple electrolyte water treatment technology first developed in Russia may enhance food safety by improving the control of *E. coli* O157:H7 in North American cattle feedlots, say researchers at Agriculture and Agri-Food Canada's Lethbridge Research Center. "Preliminary research in the lab suggests we can totally clear *E. coli* O157:H7 from a water trough using this technology. Further research is planned to see how it works under normal feedlot conditions, but we are very optimistic about the positive results," says Sam Stevenson, a Ph.D. student studying the technology under the Centre's Dr. Tim McAllister.

E. coli O157:H7 is a top disease concern of the multi-billion dollar North American cattle industry. Around 25 percent of beef and dairy cattle shed the bacteria at some point during their lives. The now infamous pathogen is not a threat to the livestock, but its potential as a water and foodborne disease has prompted a broad research effort to reduce the risk to humans. The major food contamination risk is transfer of the pathogen from the animal's intestine to the carcass during the slaughtering process. But scientists increasingly view farm management strategies, such as keeping feed bunks and water troughs clean, as a crucial component of reducing *E. coli* O157:H7

in the environment and further up the food system. "The pathogen occurs naturally on the farm, so controlling it at this level could help block movement up the market supply chain. If we can give livestock producers the tools to minimize *E. coli* O157:H7 transmission and growth on their operations, this will be a major victory in the overall campaign," says McAllister, a lead researcher on *E. coli* O157:H7 at the Centre.

Russian researchers have been investigating the electrolyzed oxidizing (EO) water treatment for more than two decades to control a variety of pathogens. The latest improved technology – developed by the Canadian/Swiss company Biostel North America – has only recently been brought to Canada for evaluation using North American standards. Studies planned over the next several years may lead to its introduction into commercial livestock facilities both on this continent and in Europe. "The technology works well in Russia and there's no reason it shouldn't do the same here. A big advantage is it's potentially very easy and economical to use – only a small concentration of treated water is enough to kill the bacteria in cattle drinking water troughs," says Stevenson.

The Biostel water treatment technology uses water containing a 0.1 percent electrolyte solution, which is put through a process that changes the solution's pH levels. "It's unclear how the process works, but preliminary results indicate the treated water contains a property that kills bacterial pathogens, including *E. coli* O157:H7," says Stevenson. Further study is planned to shed light on the process and the bacteria-killing property.

Further study is also important to fine-tune the technology under normal feedlot conditions, she says. "In a regular water trough, the 'bugs' can hide in protective material such as scum or fecal contamination, so planned studies will consider this factor." Potential applications include using the technology as part of multi-step controls to reduce pathogen loads in feedlots or packing and processing plants. The technology is used for medical and dental treatments in Japan, and other studies are testing its potential for treating vegetables, she says. "For example, spraying lettuce with electrolyzed water can get rid of bacterial contaminants before it goes to market."

Scientists Issue Pesticide Advice

Independent scientists who advise the Food Standards Agency (FSA) have concluded that washing fruit and vegetables is not required as a protection against pesticide residues. But the Agency is stressing that washing them is still a sensible food hygiene measure. The Agency asked the independent Advisory Committee on Pesticides (ACP) to review existing food safety advice from the Chief Medical Officer (CMO) in relation to pesticide residues.

It was worried that some consumers were being put off eating fruit and vegetables which are part of a healthy balanced diet because they thought they were not safe to eat unless they were washed before eating. Pesticide residues are the small amounts of pesticides that can remain in the crop after harvesting or storage and make their way into the food chain.

The Food Standards Agency wants to see pesticide residues on fruit and vegetables reduced to their lowest possible level. The ACP began reviewing the CMO advice at its meeting on October 18, 2001. On March 4, 2002 it considered the views of Friends of the Earth that the CMO advice, which also included information about peeling fruit and vegetables where appropriate, should stand.

It concluded that washing and peeling fruit and vegetables is not required as a protection against pesticide residues. According to the CMO, peeling is a matter of invidual choice. So, for example, if adults or children prefer to eat unpeeled fruit, that is fine.

The Agency supports the general advice that it is sensible to wash fruit and vegetables before eating to ensure that they are clean, but believes that as a matter of principle, safe use of a pesticide should not depend on such action by consumers.

No Excuse for Misleading Labeling Warns Food Safety Chief

The first comprehensive report on food labeling in Ireland was published recently by the Food Safety Authority of Ireland (FSAI). The Labeling of Food in Ireland 2002, produced in response to extensive queries from consumers, and all sectors of the food industry on labeling issues, aims to dispel misinterpretation as to what a food label should contain. It will ultimately benefit consumers and assist them to make informed purchasing decisions based on accurate, clear food labeling information. The FSAI has confirmed that enforcement officers throughout the country are taking a proactive stance across the food chain to ensure that food labels in Ireland comply with regulations. The 180-page report brings together in detail all Irish and European law governing the labeling of food. In addition to the full report, a summary leaflet has also been produced which is available from the FSAI and both will be helpful to consumers and the food industry.

Enforcement officers throughout the country, working under service contract to the FSAI, have been briefed on the report and have participated in workshops to assist them identify those foodstuffs that might be in breach of the regulations. In addition, the FSAI is publishing on its Web site the training material used in these workshops to allow the food industry carry out training courses for their staff, to ensure the food labels they are using conform to regulations. This training material is freely available on the FSAI's Web site www.fsai.ie.

The FSAI states that the function of food labeling is to inform purchasers of the properties, ingredients, nature and characteristics of the food they buy and labeling should not mislead consumers. The information contained in food labels should be clear, unambiguous and must not make misleading or false claims. According to Dr. Patrick Wall, Chief Executive, FSAI it should provide sufficient information, accurately and clearly, to enable consumers to select products according to their needs; to store and prepare them appropriately and to consume them safely. "It is unacceptable that consumers are purchasing foodstuffs where the labeling is incorrect, lacking clarity or is simply portraying the product as something it is not. We see the production of the detailed report and summary leaflet as beneficial to consumers, enforcement officers and industry. Industry now has no excuse for mischievous, misleading or illegal labeling and cannot claim ignorance of the legal requirements. We are not against aggressive marketing, but wish to ensure that consumers are being provided with honest accurate labeling," Dr. Wall said. "Manufacturers should not mislead the consumer by using marketing images that could be misinterpreted, omit significant information or make undue emphasis on certain words. All claims must be substantiated. The onus is on the manufacturer to demonstrate that any claims are true, and they must be able to provide documentation and evidence in support of claims which outweighs any opposing evidence or opinion," Dr. Wall maintained.

The Labeling of Food in Ireland 2002 consolidates in one publication the myriad of laws and regulations governing the area. It provides specific information and guidelines relating to the labeling of food with regard to ingredients, additives, storage instructions, nutritional labeling, novel foods and genetically modified foods. In addition, special sections cover organic food labeling, and the specific requirements of commodities such as beef, chocolate, fruit juices and milk and sugar products.

Traceability in the Food Chain

A preliminary study carried out by the Food Standards Agency (FSA) suggests that robust systems in the food chain that allow food, ingredients, feed and animals to be traced can play an important role in protecting consumers' interests with regard to food, even where consumers don't know anything about the traceability systems operating in the food chain.

The study has found that there is a wide variation in how food sources are traced and the systems used to trace them. Several systems for tracking livestock, especially beef, are well advanced and major retailers have also put in systems to trace the food they sell. But the survey found that the ability to trace food in the catering sector is not so well developed.

The diverse nature of food processing operations means that each business keeps traceability records in its own way. The methods used range from sophisticated IT to handwritten labels. But the researchers found that the quality and quantity of the information available depends on a number of factors, including the product, the law and what consumers demand.

There is currently no general legal requirement for the establishment of traceability systems in the food chain. However, some degree of traceability is required under a number of separate measures. New EU legislation is now in place to help protect consumers and ensure food safety; this includes new rules for traceability which come into force in 2005.

The FSA is now working with stakeholders to assess its priorities in encouraging effective and robust traceability in the food chain. The Preliminary Report is available at www.food.gov.uk/multimedia/pdfs/traceabilityinthefoodchain.pdf.

Industry Products

The National Food Laboratory

The New National Food Laboratory Equipment Speeds, Economizes Fluid Food Product Testing — from Pasteurization through Aseptic Processing

For food industry manufacturers running large, in-house test batches of fluid products such as milk, juice, tea, and pudding, outsourcing testing to The National Food Laboratory's (The NFL) newly purchased MicroThermics processing system can cut product development cycles, production downtime, and save thousands per day in costs. The new system, with a temperature range from pasteurization to aseptic processing (140 to 300°F), has a 12-liter minimum batch size and is capable of running up to six tests per day – allowing manufacturers to test new products or line extensions without interrupting their own production, potentially saving days of product development time and a thousand or more gallons of product per test.

"Use of our new MicroThermics system is a cost effective way to test fluid products rather than do expensive, time-consuming full production runs," said Neal Ewing, process development segment leader of The NFL's process research and microbiology division. "UHT and aseptic testing can be done quickly and effectively without purchasing and maintaining multi-million-dollar processors in-house. Our new capability allows us to help clients rapidly develop a range of new products, from refrigerated ones with longer shelf lives to shelf-stable ones at room temperature."

Food manufacturers hoping to expand marketshare, riding the trend from paper-based containers to aseptic and PET containers, may be especially interested in fine-tuning their new product development using The NFL's UHT and aseptic processing capacity. Aseptic processing offers improved product taste, while consumers tend to view products packaged in PET as being of higher quality.

The addition of the MicroThermics system complements The NFL's existing food processing capabilities including: extrusion; wet and dry blending; evaporation and spray drying; thermal processing, fruit and vegetable processing, and more. Moreover, the company offers product and process development programs for clients in a phased approach, each phase building on knowledge gained from the previous step. At clients' discretion, they can: develop products and define product specifications; define the process scenario; select equipment; test processes or equipment; execute pilot scale trials; execute commercial production trials; and write manufacturing specifications – all with an eye toward optimizing both product and process, economically.

The National Food Laboratory, Dublin, CA

Reader Service No. 237

Remove Contaminants from Steam in Food Processing by Parker Hannifin Corp.

Balston® Steam filters that permit direct steam contact with food are now available from Parker Hannifin Corp.

Balston Steam Filters remove 98+% of 0.1 micron particles and 100% of all visible particles from steam. Liquid condensate is removed at the same efficiency as for solid particles. Models are available to handle flow rates of up to 3,000 lbs/h.

Other benefits of Balston Steam filters include: Reduction in steam condensate mixing with the food products when steam is used for agitating, mixing or cooking; significant reduction in carry over of boiler feedwater chemicals into the food product, causing taste and odor problems; greatly reduced maintenance requirements for valves, cookers, heat exchangers, and other equipment.

Balston Steam Filters are in full compliance with the requirements of the US Food, Drug and Cosmetic Act. They meet the

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regulations for Indirect Food Additives used as Basic Components for Repeated Use Food Contact Surfaces as specified in 21 CFR Part 117, and Current Good Manufacturing Practices, 21 CFR Part 110. Balston Steam Filters have also been accepted by the USDA for use in federally inspected meat and poultry plants. They are also in full compliance with the 3A Accepted Practices (Number 609-00) for producing steam of culinary quality, and they are in full compliance with the requirements of the Health Protection Branch of Health and Welfare Canada.

Parker Hannifin Corporation, Tewksbury, MA

Reader Service No. 238

J. J. Keller Introduces New Security Products

J. J. Keller & Associates, Inc. recently added new tamper-evident security seals and other security products to its safety and compliance product line. New to the Keller line are a wide variety of seals to help detect and discourage cargo tampering and theft. The *Octolock™ Plastic Ball-Type Seal* is made from food-grade polypropylene and features a double-locking fastener. The multi-purpose *All® Seal* is a medium-security plastic seal that can be used on bags, cabinet doors, or containers. The *Post Grip Seal* was originally designed for the British Royal Mail. It features double-locking teeth that tightly grip onto canvas, plastic, or cloth bags, making it useful for mail bags, cash bags, cabinets, or containers. None of these three seals require special cutting tools to remove.

Also new, the *Pull-Tite Cable Seal* offers a flexible fastener that allows for a tight fit on any size latch. The *Unolock™ Bolt Seal* features a barrel that is encapsulated in clear brittle plastic to discourage theft, and requires 2,200 pounds of pull-apart strength to disengage. The *Tamper-Evident Tape Seal* is a pressure-sensitive, label-like seal that shows immediate evidence of unauthorized entry to doors, cabinets, or equipment. If the seal is removed, entry and/or tampering is indicated by the word "VOID" left on the surface to which the seal was applied.

While security seals can help prevent cargo tampering and theft, other security devices recently added to Keller's product line can deter tractor-trailer theft. Keller's *Parking Brake Truck Lock* offers a unique security feature once the plastic parking break covers are broken, the air brake valves are damaged, and the brakes cannot be released. The *18 Wheeler Club* is a steering wheel lock featuring steel construction that resists sawing, prying, and hammering.

J. J. Keller & Associates, Inc., Neenah, WI

Reader Service No. 239

Columbus Instruments, Inc.

Anaerobic Respirometer from Columbus Instruments

Columbus Instruments' new, high precision respirometer is capable of measuring gases produced during anaerobic respiration. The anaerobic process takes place in separate reactors which are connected to the sampling chamber via a very sensitive check valve. As pressure in the anaerobic reactor increases, the gas passes through the check valve into the sampling chamber. Once the gases have passed into the sample chamber they are measured by the gas analyzers. The Anaerobic Respirometer can simultaneously measure gas production from 1 to 80 different reactors in which the anaerobic process takes place. The advantage of Columbus Instruments' method is that the anaerobic process takes place in a closed reactor to which no ambient air is allowed.

The same respirometer can be re-configured for aerobic respiration. In such cases, gases are sampled from the head space of the reactors and air in the reactor can be periodically refreshed with ambient air.

The System runs under Windows and the user can select a number of gas analyzers such as O_2, CO_2, CH_4, H_2, NO_2, H_2S, CO.

Columbus Instruments, Inc. Columbus, OH

Reader Service No. 240

Silliker US GMO Lab Provides Labeling Confidence

The Silliker GMO testing center in Cedar Rapids, IA, a newly completed, state-of-the-art lab, provides real-time PCR testing to verify the absence or levels of GMOs in food products.

To help food companies and private labeling manufacturers meet international directives and organic standards for GMO labeling, the Silliker GMO Integrity Program encompasses real-time PCR testing, supplier audits, sampling programs and technical consultations.

Real-time PCR provides two types of results, screening and quantitative, using TaqMan®

technology. This technology was acquired from the Danone Group, a European food company (Dannon Food Products in the US) whose biotechnology lab developed a highly sensitive extraction technique for use with real-time PCR. Depending on the food matrix, the screening method and quantitative method can provide detection limits as low as 0.01%.

Because one stray airborne DNA particle could cause a false positive, Silliker designed a lab and QC process to ensure sample integrity. Each step in the testing process is performed in a separate room, each with its own air handling system. The special positive air pressure entryway helps prevent cross-contamination of the reagents.

Silliker, Inc., Homewood, IL

Reader Service No. 241

IDEXX Laboratories Introduces Snapshot® Reader's New Touch-Screen Technology Improves Ease of Use

IDEXX Laboratories, Inc. has announced the availability of its new SNAPshot™ Reader for use with its SNAP® family of antibiotic residue assays. The SNAPshot™ Reader, recently approved by the FDA, replaces the SNAP® Image Reader. It offers a number of innovative features to enhance ease of use and provide an improved reporting format that helps dairy producers meet regulatory requirements.

According to Jim Yeaman, IDEXX Dairy Sales, "The SNAPshot™ Reader is the first residue testing instrument that employs touch-screen technology. An easy, self-directing menu guides users through each step. Test results appear within seconds at your fingertips."

Scott Lovejoy, IDEXX Engineering, added, "The concise hard-copy printout displays all the required regulatory information, including the test name, technician and sample IDs, results ratio-positive/negative result, date and time, and lot number. The SNAPshot™ Reader also offers a smaller footprint compared to its predecessor, to free up bench space in the dairy plant."

IDEXX Laboratories, Inc., Westbrook, ME

Reader Service No. 242

Filter Specialists, Inc.

Filter Specialists, Inc. Introduces CX150/CX300 Convertible Stainless Steel Sanitary Filter Housings

Filter Specialists, Inc., has developed the new CX150 (150 psig) and CX300 (300 psig) Convertible Stainless Steel Sanitary Filter Housings. These Filter Housings are manufactured of 316 Stainless Steel. Finishes available for the wetted surfaces and outer housing of the vessels include 32 microinch (3A) Sanitary with a bright electropolish finish on outside of the housing. The standard finish for the wetted surfaces and outer housing of the vessels is 45 Ra with a bright electropolish finish on the outside of the housing.

The CX150/CX300 Filter Housings are convertible, having been designed to accept either a filter bag or a filter cartridge. Additionally, the CX150/CX300 are equipped with a device that will not allow the units to be pressurized if not closed properly, nor can the units be opened unless pressure has been released. FSI engineered the CX150/CX300 with a "clean wall" design, a smooth interior surface that allows faster, easier manual cleaning or in-place flushing. The CX150/CX300 Filter Housings are ideally suited for sanitary filtration needs for all industries including pharmaceutical, food, dairy and semiconductor.

Filter Specialists, Inc., Michigan City, IN

Reader Service No. 243

Guelph Food Technology Centre Accelerated Shelf-Life Studies Help Products Reach More Customers

A basic truth in the food industry is that the longer the shelf-life of your product, the greater the distribution you can encompass, and the more customers your product can reach. Extending shelf-life can be a detailed and complex process and it is best to begin by first determining the product's current shelf-life. The Guelph Food Technology Centre (GFTC) is proud to offer Accelerated Shelf-Life Testing Services in its continuing efforts to help its clients reach their goals of producing great products.

"For products with a relatively short shelf-life, such as dairy products and packaged meats, one can test for shelf-life in real time without inconveniencing the client," explains Judy Stuart, GFTC's senior applied research specialist. "For products with a longer shelf-life – a year or more, for example–many of our clients want to accelerate the

process in order to determine the shelf-life in a shorter time."

Accelerating shelf life is no small undertaking. "There are three basic steps," explains Ms. Stuart. "First you identify the quality factor that determines the end of the shelf-life, then you identify the agent responsible for the deterioration (such as oxygen, light, temperature, relative humidity, microorganisms or enzymes), and then devise a means to increase the effect of the agent in a controlled manner. Some people use the basic 'rule of thumb' that applies to many chemical reactions, i.e. a ten degree Celsius increase in temperature doubles the rate of a reaction. However, this is only a very general rule, and does not necessarily hold for mechanisms that are not chemical reactions, for example, those involving microorganisms or enzymes. In addition, increasing the temperature can bring about unexpected changes in something as complex as a food product; for example, solid fats may melt. We have to treat each product that we test under accelerated conditions as a unique system."

Guelph Food Technology Centre, Guelph, Ontario, Canada

Reader Service No. 244

L. J. Star Inc., Full-View Visual Flow Indicator Meets Sterile-Service Needs

Operators are provided a full 360° view of the flow of virtually any process fluid by a new line of sterile-service visual flow indicators from L. J. Star.

Readily installed as a retrofit component, the units come standard in eleven sizes with a choice of clamp connection, butt weld or sterile quick-connect electropolished stainless steel heads.

A unique O-ring design provides a smooth internal transition between the flow indicators'

L. J. Star Incorporated

stainless steel heads and the glass viewing column. This eliminates any chance of product entrapment and ensures that the unit adds virtually no additional back-pressure to system flow. The units may also be sterilized or autoclaved.

Durability is assured and maintenance requirements minimized by the overall design of the visual flow indicator. The spacers between the indicators' heads make disassembly quick and easy, while making it impossible to over-stress the glass column by over-tightening. This design, with acorn nut fastening, also eliminates exposed threads. Impact-resistant stainless steel mesh shields are available to protect the glass column, where necessary.

All sizes are rated for service up to 150 psi. Standard material for sanitary service is 316L stainless steel but for corrosive service Hastelloy®, AL6XN®, Monel® and Alloy 20 versions are also available. EPDM is the standard O-ring gasket material with FEP encapsulated silicone as available options. Clamp sizes range from 3/8-in. to 8-in. with total lengths of 90 to 302 mm (3.54 to 11.9-in.) and custom designs, including special lengths, are available.

L. J. Star Incorporated, Twinsburg, OH

Reader Service No. 245

NASCO's Whirl-Pak® Speci-Sponge® Bags for Environmental Surface Sampling

The newest Whirl-Pak® Speci-Sponge® Bags are now available from NASCO in Fort Atkinson, WI; Modesto, CA; and Aurora, Ontario, Canada. Used for environmental surface sampling, these new write-on bags are available in three different ways – Speci-Sponge® with sterile phosphate buffer, Speci-Sponge® with sterile gloves, or Speci-sponge® with buffer and gloves.

The Whirl-Pak® Speci-Sponge® Bag is designed for environmental surface sampling of work areas, equipment, animal carcasses, and any other place there testing for *Listeria*, *Salmonella*, *E. coli*, and other foodborne pathogens is required. The special sterilized sponge is free of bactericides and has been tested to be non-inhibitory. It measures approximately 1 1/2" × 3" × 5/8" thick when wet. After the sample has been collected and the sponge returned to the bag, it can be sent to a lab for testing.

Speci-Sponge® Bags save time and money and provide a sample package with all of the necessary components required to collect a sample. You can choose the option that is best for our sampling needs. The 10 ml vial of general-purpose buffer has a pH of 6.8 and optimizes the stability of growth of most organisms. The special cap on the vial can be removed by gently pushing it off with your thumb from outside the bag. Once open, the buffer will empty into the bag and moisten the sponge. To use the gloves, simply tear off the glove pack along the perforation. The gloves are packaged with the open end up, so they can be put on without touching or contaminating the hand area.

NASCO, Fort Atkinson, WI

Reader Service No. 246

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Committee Meetings

Sunday, June 30, 2002

7:00 A.M. – 10:00 A.M.

Affiliate Council – *Manchester Ballroom A*

8:00 A.M. – 5:00 P.M.

Communicable Diseases Affecting Man – *Conference Parlor #617*

10:00 A.M. – 12:00 P.M.

3-A Committee on Sanitary Procedures – *Gibbons A*
Applied Laboratory Methods – *Conaught*
Food Safety Network – *Windsor C*
JFP Management – *Windsor AB*
Microbial Risk Analysis – *Oxford*
Retail Food Safety & Quality – *Cunningham A*
Viral and Parasitic Foodborne Disease – *Cunningham B*

12:00 P.M. – 1:30 P.M.

Student – *Manchester Ballroom A*

12:30 P.M. – 3:00 P.M.

Water Safety and Quality – *Cunningham C*

1:00 P.M. – 3:00 P.M.

Dairy Quality and Safety – *Gibbons A*
Food Sanitation – *Windsor C*
Foundation Fund – *Oxford*
Fruit and Vegetable Safety and Quality – *Windsor AB*
Meat and Poultry Safety and Quality – *Cunningham A*
Seafood Safety and Quality – *Cunningham B*

2:00 P.M. – 4:00 P.M.

DFES Management – *Conaught*

3:00 P.M.– 4:00 P.M.

Constitution and Bylaws – *Cunningham A*

3:00 P.M. – 5:00 P.M.

Audiovisual Library – *Oxford*
Awards – *Cunningham B*
HACCP Task Force – *Windsor C*
Nominating – *Gibbons A*
Outreach Education – *Cunningham C*
Past Presidents' – *Windsor AB*

4:00 P.M. – 5:00 P.M.

Program – *Cunningham A*

Award Winners

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Not presented this year

C. B. SHOGREN MEMORIAL

Florida Association for Food Protection

BEST ANNUAL MEETING FOR AFFILIATES

Washington Association for Food Protection

BEST EDUCATIONAL CONFERENCE FOR AFFILIATES

Wisconsin Association of Milk and Food Sanitarians, Inc.

BEST COMMUNICATION MATERIALS FOR AFFILIATES

New York Association for Food Protection

MEMBERSHIP ACHIEVEMENT FOR AFFILIATES

Highest Number Increase:

Upper Midwest Dairy Industry Association

Highest Percentage Increase:

Kansas Association of Sanitarians

Ivan Parkin Lecture

will be presented by

Mitchell L. Cohen, M.D

Director
Division of Bacterial and Mycotic Diseases
National Center for Infectious Diseases
Centers for Disease Control and Prevention
Atlanta, Georgia

Food Safety in the Time of Anthrax

Sunday, June 30, 2002

Opening Session — 7:00 p.m.

Mitchell L. Cohen, M.D.

Dr. Mitchell L. Cohen received his undergraduate and medical degrees from Duke University. His postgraduate training was in internal medicine at the University of Texas Southwestern Medical School, and his Infectious Disease Fellowship was completed at the University of Washington in Seattle. Since 1976, he has held positions in the Enteric Diseases Branch; Hospital Infections Program; and Office of the Director in the Division of Bacterial and Mycotic Diseases. His research interests include the epidemiology of antimicrobial resistance, foodborne diseases, and the application of molecular biology techniques to answer epidemiologic questions. He has been editor and reviewer for a number of scientific journals. He is a Fellow in the American College of Physicians and the Infectious Diseases Society of America. Dr. Cohen has been a member of several advisory committees including the Recombinant DNA Advisory Committee, National Institutes of Health, and the National Advisory Committee on Microbiological Criteria for Foods.

June 30–July 3, 2002
San Diego, CA

Preliminary Program

SUNDAY EVENING — JUNE 30, 2002
7:00 p.m. — 8:00 p.m.

Opening Session — Regency Ballroom

Presentation of the International Association for Food Protection Fellows Awards

Ivan Parkin Lecture — **Food Safety in the Time of Anthrax**, Mitchell L. Cohen, M.D., Director, Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC, Atlanta, GA

Cheese and Wine Reception will follow in the Exhibit Hall

MONDAY MORNING — JULY 1, 2002
8:30 a.m. — 12:00 p.m.

S01 Antibiotic Resistance in Humans and Feed Animals — Manchester Ballroom A-B

Sponsored by ILSI N.A.

Organizer: Catherine Nnoka

Convenors: Stan Bailey and Marguerite Neill

8:30 • Historical Perspective on the Problem of Antibiotic Resistance—To be determined

9:00 • Resistance in *Salmonella* Newport—AMITA GUPTA, CDC, Atlanta, GA, USA

9:30 • Multiple Drug Resistance — Trends and Implications—PAULA J. FEDORKA-CRAY, USDA-ARS-RRC, Athens, GA, USA

10:00 • Break

10:30 • Antibiotic Resistance Trends in Europe—E. JOHN THRELFALL, Centeral Public Health Laboratory, London, UK

11:00 • Perspectives in Addressing the Safety of Cephalosporin Use in Animal Medicine—SUSAN F. KOTARSKI, Pharmacia Animal Health, Kalamazoo, MI, USA

11:30 • Consequence of Removal of Subtherapeutic Antibiotics from European Farms—HANNE-DORTHE EMBORG, Danish Veterinary Institute, Copenhagen, Denmark

S02 Viruses in Foods — Regency Ballroom A-B

Organizer: Sagar M. Goyal

Convenors: Sagar M. Goyal and Craig W. Hedberg

8:30 • The Epidemiology of Norwalk-like Viral Gastroenteritis—CRAIG W. HEDBERG, University of Minnesota, Minneapolis, MN, USA

9:00 • Investigating Outbreaks of Foodborne Viral Gastroenteritis—PAUL ALLWOOD, Minnesota Dept. of Health, St. Paul, MN, USA

9:30 • CaliciNet: A Tool to Improve Surveillance for Norwalk-like Viruses—STEVE MONROE, CDC, Atlanta, GA, USA

10:00 • Break

10:30 • Environmental Persistence and Transfer of Norwalk-like Viruses—LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

11:00 • Viral Indicators and Methods of Detection—SAGAR M. GOYAL, University of Minnesota, St. Paul, MN, USA

11:30 • Control Strategies—DEAN O. CLIVER, University of California-Davis, Davis, CA, USA

S03 Development in Intervention Technologies to Enhance Produce Safety
– Regency Ballroom C

Sponsored by Air Liquide and IAFP Foundation Fund

Organizers/Convenors: Bassam A. Annous and James T. C. Yuan

8:30 • The Role of Ozone in a Microbial Intervention Strategy for Food Processing—BRIAN C. HAMPSON, California Polytechnic State University, San Luis Obispo, CA, USA

9:00 • Pulsed Electric Field as an Antimicrobial Treatment of Fruit and Vegetable Juices—HOWARD Q. ZHANG, Ohio State University, Columbus, OH, USA

9:30 • Low-dose Irradiation of Fruits and Vegetables as an Antimicrobial Treatment—BRENDAN A. NIEMIRA, USDA-ARS-ERRC, Wyndmoor, PA, USA

10:00 • Break

10:30 • The Role of High Pressure Processing Technology in Microbial Intervention Strategy—DALLAS G. HOOVER, University of Delaware, Newark, DE, USA

11:00 • Effectiveness of Antimicrobial Food Packaging Materials—KAY COOKSEY, Clemson University, Clemson, SC, USA

11:30 • Novel Development in Intervention Strategies to Enhance Produce Safety at ERRC—BASSAM A. ANNOUS, USDA-ARS-ERRC, Wyndmoor, PA, USA

S04 Safety of Latin-Style High Moisture Fresh Cheese – Cunningham Room

Organizers/Convenors: Steven C. Murphy and John E. Rushing

8:30 • Small Cheese Manufacturing Operations in Central America—JOHN RUSHING, North Carolina State University, Raleigh, NC, USA

9:00 • Anatomy of an Outbreak—SUE GRAYSON, State of North Carolina, Environmental Health Services, Raleigh, NC, USA

9:30 • Tracking Sources of Environmental Contamination (*Listeria monocytogenes*) in Latin-Style Cheese—KATHRYN J. BOOR, Cornell University, Ithaca, NY, USA

10:00 • Break

10:30 • Application of HACCP in a Latin-Style Cheese Plant—EVA RODRIGUEZ, Tropical Cheese Industries, Perth Amboy, NJ, USA

11:00 • Safety and Regulatory Issues with Domestic and Imported Latin-Style Cheese—JACK GUZEWICH, FDA, College Park, MD, USA

11:30 • Panel Discussion

T01 Meat and Poultry Microbiology
– Regency Ballroom D-E

8:30 T1 • Review of the USDA *Escherichia coli* Draft Risk Assessment – Findings of a National Academy of Sciences Study—DAVID A. BUTLER and Ricardo A. Molins, National Academy of Sciences, Washington, D.C., USA

8:45 T2 • Microbiological Risk Assessment on Raw Beef Carcasses in Ontario Abattoirs—PAT JOHNSON, Joseph Odumeru, Abdullahi Mahdi, and Tom Baker, Ontario Ministry of Agriculture, Guelph, Ontario, Canada

9:00 T3 • Incidence of *Clostridium perfringens* in Commercially Produced Cured Raw-Meat-Product Mixtures and Behavior in These Products during Cooking, Chilling, and Refrigerated Storage—PETER J. TAORMINA, Gene W. Bartholomew, and Warren J. Dorsa, John Morrell and Co., Cincinnati, OH, USA

9:15 T4 • Microbiological Analysis of Ground Beef Treated with Hydrodynamic Pressure Processing—ANISHA WILLIAMS-CAMPBELL and Morse Solomon, USDA-ARS, Beltsville, MD, USA

9:30 T5 • High Efficiency Microbial Collection of Beef Carcasses with Wet-Vacuum Procedures—BRUCE J. BRADLEY, Filomena S. Saddler, and Joseph K. Hillers, Microbial-Vac Systems, RMR Labs, Inc., Jerome, ID, USA

9:45 • Break

10:15 T6 • Microbiological Profile of Air Chilled Chickens from Farm to Table—W. FLUCKEY, M. Sanchez, M. Brashears, S. McKee, and E. Pendleton, Texas Tech University, Lubbock, TX, USA

10:30 T7 • Association of *Campylobacter* spp. Levels in Poultry Production to Levels Found on Processed Product—NORMAN J. STERN and Michael C. Robach, USDA-ARS-RRC, Athens, GA, USA

10:45 T8 • *Salmonella* on Free-range Chickens—J. S. BAILEY and D. E. Cosby, USDA-ARS, Athens, GA, USA

11:00 T9 • Comparison of *Salmonella* Prevalence Rates on Chicken Carcasses Before and After Processing—J. S. BAILEY and N. J. Stern, USDA-ARS, Athens, GA, USA

11:15 T10 • Comparison of Shelf Life and Microbial Profile of Immersion-chilled and Air-chilled Broilers—NGAH-WAN (JENNIFER) PHOON, S. R. McKee, and M. Brashears, University of Nebraska-Lincoln, Lincoln, NE, USA

11:30 T11 • Inhibition of *Campylobacter jejuni* by Bacteria Isolated from Broiler Deboning Operations—TAM L. MAI and Donald E. Conner, Auburn University, Auburn, AL, USA

11:45 T12 • *Zygosaccharomyces bailii* and Other Yeasts Associated with Refrigerated Storage of Commercially Processed Broiler Carcasses—ARTHUR HINTON, JR., J. A. Cason, and Kimberly D. Ingram, USDA-RRC, Athens, GA, USA

P01 Microbiological Methods and Antimicrobials – Exhibit Hall, Manchester Ballroom

10:00 a.m.–1:00 p.m.
(Authors present 10:30 a.m.–12:30 p.m.)

Convenors: Steve Kenney and Rico Suhalim

P1 • Monitoring the Effectiveness of Cleaning in Food Processing Plants—GINNY MOORE and Chris Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P2 • Comparison of Methods to Improve Sensitivity in a Multiplex PCR Reaction for Detection of *Escherichia coli* O157:H7 in Fresh Produce—MICHAEL A. GRANT, FDA, Bothell, WA, USA

P3 • Evaluation of COMPASS L. mono, a New Chromogenic Medium for Highly Specific Isolation of *Listeria monocytogenes*—CHRISTOPHE QUIRING, David Miller, and Pierre-Yves Marquet, Biokar Diagnostics-Solabia, Pantin cedex, France

P4 • The Effect of pH and Agitation on the Growth of *Listeria monocytogenes* in Brain Heart Infusion (BHI) Broth Containing Combined Potassium Lactate and Sodium Diacetate Stored at 4°C and 10°C—RUTH A. BARRATT, Ki. S. Yoon, and Richard C. Whiting, University of Maryland Eastern Shore, Princess Anne, MD, USA

P5 • A Comparison of the Microbact System with the Conventional ISO Method and the API Gallery for Identification of *Listeria* Isolates—Marie-Laure Sorin, Sandrine Rougier and PATRICE ARBAULT, Diffchamb SA, Lyon, France

P6 • A Rapid Antibody Specific Method for the Detection of Food Pathogens from Environmental Surfaces Using the RBD2100—KRISTI R. HARKINS, Kelley Harrigan, Lillian M. Erdahl, and Jan M. Tippett, Advanced Analytical Technologies, Inc., Ames, IA, USA

P7 • Detection of Salmonellae from Poultry by Real-Time PCR—AYSEGUL EYIGOR, Kamil Tayfun Carli, and Can Bora Unal, Uludag University, Gorukle Kampusu, Bursa, Turkey

P8 • Inactivation of Refrigerator Biofilm Bacteria for Application in the Food Service Environment—BARRY MICHAELS, Troy Ayers, Marlene Celis and Vidhya Gangar, Georgia-Pacific Corporation, Palatka, FL, USA

P9 • Prediction of Raw Produce Surface Area from Weight Measurement—JOSEPH EIFERT, Gabriel Sanglay and Dah-Jye Lee, Virginia Tech., Blacksburg, VA, USA

P10 • A Practical Solution to the Problems Associated with Rapid Pathogen Detection—ADRIAN PARTON and Roy Betts, Matrix Microscience Ltd., Newmarket, Cambridge, UK

P11 • Detection of Pathogenic *Yersinia enterocolitica* in Drinking Water and Vegetables by a Mutiplex PCR—T. S. LEE, B. K. Park, and D. H. Oh, Kangwon National University, Chunchon, Kangwon, Korea

P12 • Viability and Morphology Assessment of *Bacillus cereus* Following Exposure to Sanitizers—M. E. Peta, D. Lindsay, V. S. Brözel, and A. VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P13 • *Bacillus cereus* Cell Size Decreases When Exposed to Alkaline Ph—D. Lindsay, M. C. Oosthuizen, V. S. Brözel, and A. VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P14 • Improving the Sensitivity of Detecting Bacterial Foodborne Pathogens in Fresh Produce by PCR—CHING-HSING LIAO and Lisa M. Shollenberger, USDA-ARS-ERRC, Wyndmoor, PA, USA

P15 • Comparison of Two Methods for the Detection of *Salmonella* Enteritidis in Shell Eggs—I. E. VALENTÍN-BON, K. H. Seo, R. E. Brackett, T. S. Hammack, and W. Andrews, FDA-CFSAN, Washington, D.C., USA

P16 • Comparison of Four Selective Agar Media for *Campylobacter* Detection from Poultry Samples—Marius Van Eck, Esther Broekmaat, and FLORENCE GORSE, bioMerieux, Marcy l'Etoile, France

P17 • Evaluation of a New Alternative Method for *Campylobacter* Detection in Food Samples—Marius Van Eck, Esther Broekmaat, and FLORENCE GORSE, bioMerieux, Marcy l'Etoile, France

P18 • Development of Fluorescence Polarization Immunoassay (FPIA) for the Rapid and Quantitative Determination of Herbicide, 2,4-dichlorophenoxyacetic Acid—JI-HUN KIM, Jung-Hyun Park, Yoon-Jung Kim, Sung-Jo Kang, and Duck-Hwa Chung, Gyeongsang National University, Gyeongnam, Korea

P19 • Automated Measurements of AntiListerial Activities of Lactate and Diacetate in Ready-to-eat Meat—EVELYNE MBANDI and Leora A. Shelef, Wayne State University, Detroit, MI, USA

P20 • A Comparison of Vidas *Listeria monocytogenes* II with the EN ISO 11290-1 Method for the Detection of *Listeria monocytogenes* in Food Samples—Stéphanie Souchon, Carole Ragot, Christine Cullafroz, and JEAN-MICHEL PRADEL, bioMerieux, Marcy l'Etoile, France

P21 • Characterization of *Staphylococcus aureus* Isolated from Stock Farms in Korea Using the Polymerase Chain Reaction and Random Amplification Polymorphic DNA Analysis—KWANG-SOO HA, Seon-Ja Park, Ann F. Draughon, and Duck-Hwa Chung, Gyeongsang National University, Gyeongnam, Korea

P22 • Rapid Detection of *Campylobacter jejuni* on Chicken Carcasses Using PCR-based Fluorescent Method—HONG WANG, Yanbin Li, and Michael F. Slavik, University of Arkansas, Fayetteville, AR, USA

P23 • Detection of Verocytotoxigenic *Escherichia coli* by Use of a PCR/DNA Probe Membrane-based Colorimetric Detection Assay—JUSTINE FITZMAURICE, Geraldine Duffy, Maura Glennon, Terry Smith, Cyril Carroll, Majella Maher, National University of Ireland, Galway, Ireland

P24 • Evaluation of MIST Alert™ in Paralytic Shellfish Poison Testing of Clams and Molluscs—B. H. HIMELBLOOM, University of Alaska-Fairbanks, Kodiak, AK, USA

P25 • Efficacy of a Unique Quaternary/Peroxide Foaming Sanitizer against Spoilage and Pathogenic Foodborne Microorganisms—J. M. BIEKER, H. Thippareddi, R. K. Phebus, C. L. Kastner, and A. L. Reicks, Kansas State University, Manhattan, KS, USA

P26 • Rapid Detection of Microorganisms in Aseptic Products Using an ATP Bioluminescent System—TOSHINORI IGARASHI and Seiji Murakami, Kikkoman Corporation Research and Development Div., Noda, Chiba Pref., Japan

P27 • Rapid Detection of Coliforms Using a Sensitive Bioluminescence Assay—HIROKI TATSUMI and Satoshi Fukuda, Kikkoman Corporation Research and Development Div., Noda, Chiba Pref., Japan

P28 • Evaluation of a Rapid Detection Method for *Listeria* Species in Meat Products Following the USDA/FSIS Enrichment Protocol—CHARLES CARVER and Jean Michel Pradel, rtech laboratories, St. Paul, MN, USA

P29 • The Effectiveness of Sanitizers to *Escherichia coli* O157:H7 Biofilms with *Micrococcus* Species—D. K. JEONG and J. S. Lee, Kosin University, Busan, Republic of Korea

P30 • Independent Laboratory Evaluation of a New Rapid Method for the Detection of *Listeria monocytogenes* in Various Meats—CHARLES CARVER and Jean Michel Pradel, rtech laboratories, St. Paul, MN, USA

P31 • Independent Laboratory Evaluation of a New Rapid Method for the Detection of *Listeria monocytogenes* in Vegetables and Seafood—CHARLES CARVER and Jean Michel Pradel, rtech laboratories, St. Paul, MN, USA

P32 • Protein Profile Changes in *Listeria monocytogenes* after Sub-lethal High Pressure Processing—NICOLE MAKS, Sadhana Ravishankar, Claudia Rodriguez, and Peter J. Slade, Illinois Institute of Technology, Summit-Argo, IL, USA

P33 • 3M™ Petrifilm™ Staph Express Count Plate for the Rapid Enumeration of *Staphylococus aureus* in Foods—BARBARA HORTER and Muriel Moreau, 3M Microbiology Products, St. Paul, MN, USA

P34 • Analysis of mRNA as a Marker for Viability of *Campylobacter* spp. by RT-PCR—KIDON SUNG, Kelli L. Hiett, and Norman J. Stern, University of Georgia, Athens, GA, USA

P35 • Microwave vs. Dry Ash Digestion as Used as a Precursor in the Mineral Analysis by Inductively Coupled Plasma Emission Spectroscopy of Infant Formula—Wai Yip, EUGENE P. WOLKOW, Michael Iorsh, and Mohammed R. Islam, FDA, Jamaica, NY, USA

P36 • Detection of Naturally Occurring *Campylobacter* in Poultry Rinses by Capicitance Monitoring—ERIC LINE, USDA-ARS-RRC, Athens, GA, USA

P37 • Determination of *Listeria* Attachment Using a Polystyrene Culture Tube Method—NURDAN A. KOCAOGLU-VURMA and Hua Wang, The Ohio State University, Columbus, OH, USA

P38 • *Campylobacter jejuni* Transformation Frequency Declines during Log Phase in Liquid Culture—DAVID WILSON, Julia Bell, Linda Mansfield, and John Linz, Michigan State University, East Lansing, MI, USA

P39 • Membrane Filtration as Part of Sample Treatment for Improved Pathogen Detection—TONG-JEN FU and Olif M. VanPelt, FDA, Summit-Argo, IL, USA

P40 • Influence of Extended Acid Stressing in Fresh Beef Decontamination Fluids on Sanitizer Inactivation of Acid-adapted *Escherichia coli* O157:H7 Biofilms—J. D. STOPFORTH, P. A. Kendall, G. C. Smith, and J. N. Sofos, Colorado State University, Ft. Collins, CO, USA

P41 • Vanilla and Cinnamon Extracts as Antimycotic Agents in Fruit-based Agar Systems—Victoria Perez-Petrone, Ivonne Audiffred, Fidel T. Vergara-Balderas, ENRIQUE PALOU, and Aurelio López-Malo, Universidad de las Américas-Puebla, Puebla, Mexico

P42 • Antibacterial Activity of Thymol, Eugenol, Vanillin, Carvacrol, Citral, Potassium Sorbate and Sodium Benzoate against *Staphylococcus aureus* in Culture Medium—Anglica Santiesteban-Lopez, Stella M. Alzamora, Enrique Palou, and AURELIO LOPEZ-MALO, Universidad de las Américas-Puebla, Puebla, Mexico

P43 • Marginal Safety of Irradiation Dosage for Reduction and Post-irradiation Survival of *Listeria monocytogenes* in Ready-to-eat (RTE) Meats—SALLY C. C. FOONG, Glenda L. Gonzalez, and James S. Dickson, Iowa State University, Ames, IA, USA

P44 • Effect of Modified Alkaline Cooking on Aflatoxin Content in Contaminated Corn—M. E. ARREOLA, T. M Cabanillas, G. G. Uribe, and S. D PEÑA BETANCOURT, U.A.M., Mexico, D.F., Mexico

(Monday a.m., *continued*)1

P45 • Bacteriocinogenic *Lactobacillus sake* 1 Inhibits *Listeria monocytogenes* in a Model Meat Gravy System—E. C. P. DE MARTINIS and V. F. Alves, Faculdade de Ciências Farmacêuticas de Ribeirão Preto - USP, Ribeirão Preto, São Pãulo, Brazil

P46 • Effects of Gamma Irradiation on the Storage Quality of Dry Groats of Coix—FONG-IN CHOU, Hsiao-Ping Chung, and Hsiao-Wei Wen, National Tsing Hua University, Nuclear Science and Tech. Development Center, HsinChu, Taiwan, The Republic of China

P47 • Antagonistic Activity of Natural Herb Product against *Salmonella* and *Escherichia coli* O157:H7—SO HYUN KIM, Nam Hoon Kwon, Ji Yeon Kim, Ji Youn Lim, WonKi Bae, Jun Man Kim, Kyoung Min Noh, Jin Hur, Woo Kyung Jung, Sook Shin, Jong Eun Lee, Jung Chan Ra, and Yong Ho Park, Seoul National University, Kwon-Sun Gu, Suwon, Gyunggi, Korea

P48 • Growth/No Growth Interface of Selected *Aspergilli* as a Function of pH, Incubation Temperature and Vanillin Concentration—Aurelio López-Malo and ENRIQUE PALOU, Universidad de las Américas-Puebla, Puebla, Mexico

P49 • Thymol Inhibitory Concentrations of *Aspergillus parasiticus* Growth Determined by Probabilistic Modeling—AURELIO LÓPEZ-MALO and Enrique Palou, Universidad de las Américas-Puebla, Puebla, Mexico

P50 • Antimicrobial Resistance and Plasmid Analysis of *Campylobacter jejuni* Isolated from Clinical Samples—XIAO WANG, Carl Gilbert, Donald Cave, Michael F. Slavik, Univerisity of Arkansas, Fayetteville, AR, USA

P51 • Combined Effect of Lactic Acid and Nisin Solution in Reducing the Levels of Microbiological Contamination in Red Meat Carcasses—YASMINA BARBOZA DE MARTINEZ, Kenna Ferrer, and Enrique J. Marquez, Universidad del Zulia, Maracaibo, Zulia, Venezuela

MONDAY AFTERNOON — JULY 1, 2002
1:30 p.m. — 5:00 p.m.

S05 • **Enhancing Agricultural Security** — Manchester Ballroom A-B

Organizer: Ann Draughon

Convenors: Ann Draughon and Ewen Todd

1:30 • Harnessing the Intellectual and Physical Resources Needed to Combat Agroterrorism—ED MATHER, National Food Safety and Toxicology Center, Michigan State University, East Lansing, MI, USA

2:00 • Agroterrorism — Homegrown and Imported—JEFF GOLDBURG, Core Processes, Inc., Alexandria, VA, USA

2:30 • Animal Disease and the Threat of Agricultural Bioterrorism—To be announced

3:00 • Break

3:30 • Communications and Organization of Response Teams—PAUL JONMAIRE, Ecology and Environment, Inc., Lancaster, NY, USA

4:00 • Rapid and Real-Time Methodology for Identifying Agents of Destruction—C. NEAL STEWART, JR., University of North Carolina, Greensboro, NC, USA

4:30 • Laboratory Security Issues — Regulations and Challenges—To be announced

S06 **Minimizing the Risk of *Salmonella* Enteritidis in Shell Eggs** — Regency Ballroom A-B

Sponsored by Auburn University Poultry Products Safety and Quality Program, IAFP Foundation Fund, and United Egg Producers

Organizers/Convenors: Robert E. Brackett and Donald E. Conner

1:30 • Overview of *Salmonella* Enteritidis Risks Associated with Shell Eggs—ROBERT E. BRACKETT, FDA-CFSAN, College Park, MD, USA

1:45 • Risk Factors for *Salmonella* Enteritidis Infection of Laying Hens—RICHARD K. GAST, USDA, Southeast Poultry Research Laboratory, Athens, GA, USA

2:15 • Environmental Testing for *Salmonella* Enteritidis in Layer Houses—MARK WALDERHAUG, FDA-CFSAN, Washington, D.C., USA

2:30 • Reduction of *Salmonella* Enteritidis in Shell Eggs in the United Kingdom—ROBERT R. H. DAVIES, Veterinary Laboratories Agency, Surrey, UK

3:00 • Break

3:30 • Emerging Technologies for Rapid Cooling of Shell Eggs—PATRICIA A. CURTIS, Auburn University, Auburn University, AL, USA

4:00 • Pasteurization of Shell Eggs—BRIAN SHELDON, North Carolina State University, Raleigh, NC, USA

4:30 • HACCP for Shell Egg Packing and Processing—SHELLY McKEE, University of Nebraska, Lincoln, NE, USA

S07 **Microbiological Food Safety at Retail** — Regency Ballroom C

Sponsored by IAFP Foundation Fund

Organizer: Vickie Lewandowski

Convenors: Albert Espinoza and Vickie Lewandowski

1:30 • Foodborne Outbreaks Associated at Retail—SHELLY HUDDLE, CDC, Atlanta, GA, USA

2:00 • Redefining Potentially Hazardous Foods—FRANK BUSTA, University of Minnesota, St. Paul, MN, USA

2:30 • Suppliers to Retail Operations – Control Measures–TIM FREIER, Cargill, Wayzata, MN, USA

3:00 • Break

3:30 • Microbial Control Strategies at Retail–SHEILA COHN, National Restaurant Association, Washington, D.C., USA

4:00 • Viruses at Retail – Incidence and Control–SUSAN SUMNER, Virginia Tech, Blacksburg, VA, USA

4:30 • Management of Food Safety Risks at Retail–DAVID THENO, Jack-in-the-Box, Inc., San Diego, CA, USA

S08 Extended Shelf Life Meat Products – Issues and Interventions
– Cunningham Room

Sponsored by FOSS

Organizer: Carl S. Custer

Convenors: J. Stan Bailey and Carl S. Custer

1:30 • An Overview of the Microbiology of Extended Shelf Life Products–BRUCE TOMPKIN, ConAgra Foods, Inc., Downers Grove, IL, USA

2:00 • Low-Temperature-Growing *Clostridia*–DOROTA M. BRODA, AgResearch Limited, Hamilton, New Zealand

2:40 • Unusual Spoilage in Vacuum Packed Cooked Meats–RICHARD A. HOLLEY, University of Manitoba, Winnipeg, Manitoba, Canada

3:10 • Break

3:40 • Update on Prevalence and Persistence of *Listeria monocytogenes* in Ready-to-eat Meat–JOHN LUCHANSKY, USDA-ARS-ERRC, Wyndmoor, PA, USA

4:10 • Intervention Strategies–ROBIN KALINOWSKI, ConAgra Foods, Inc., Downers Grove, IL, USA

4:40 • Additives as Interventions in Processed Meats–JOHN SOFOS, Colorado State University, Ft. Collins, CO, USA

T02 Microbiological Methods
– Regency Ballroom D-E

1:30 T13 • A Non-selective/Differential Medium for Recovery of Stressed *Salmonella* from Cultured Dairy Products–YASHODHAR BURGULA and Sita Tatini, University of Minnesota, St. Paul, MN, USA

1:45 T14 • Comparison of Automated BAX for Screening System for *Listeria monocytogenes* and *Salmonella* with Culture Methods–EILEEN M. COLE, W. Mark Barbour, and George Tice, DuPont Qualicon, Wilmington, DE, USA

2:00 T15 • Direct Microscopic Observation and Visualization of Viability Detection of *Campylobacter jejuni* on Chicken Skin–WALAIRUT CHANTARAPANON, Mark Berrang, and Joseph F. Frank, University of Georgia, Athens, GA, USA

2:15 T16 • Withdrawn

2:30 T17 • Development of a Selection Method for Detection of Shiga Toxin-producing *Escherichia coli* Based on Glutamate-dependent Acid Resistance–GEUNWOO PARK and Francisco Diez-Gonzalez, University of Minnesota, St. Paul, MN, USA

2:45 • Break

3:15 T18 • Spinal Cord Tissue Detection in Comminuted Beef: Comparison of Two Immunological Methods–MAHA HAJMEER, Dean O. Cliver, and Roger Provost, University of California-Davis, Davis, CA, USA

3:30 T19 • Comparison of Recovery of Airborne Microorganisms in a Dairy Cattle Facility Using Selective Agar and Thin Agar Layer (TAL) Resuscitation Media–BETH ANN CROZIER-DODSON and Daniel Y. C. Fung, Kansas State University, Manhattan, KS, USA

3:45 T20 • A Simple and Inexpensive Method to Concentrate Bacteria from Produce for Detection Using Cultural or Molecular Techniques–LYNETTE KLEMAN and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

4:00 T21 • Studies to Select an Appropriate Non Pathogenic Surrogate *Escherichia coli* Strain for Use in Place of *Escherichia coli* O157:H7 in a Pilot Plant Environment–B. A. ANNOUS, D. C. R. Riordan, and G. M. Sapers, USDA-ARS-ERRC, Wyndmoor, PA, USA

4:15 T22 • Pediococcus Species NRRL B02354 as a Thermal Surrogate in Place of Salmonellae and *Listeria monocytogenes*–JEFFREY KORNACKI and Joshua Gurtler, University of Georgia, Griffin, GA, USA

4:30 T23 • Development of a Spatially Valid Sampling Technique for the Enumeration of *Salmonella* in the Swine Abattoir Holding Pen–Annette O'Connor, JARED K. GAILEY, and H. Scott Hurd, Iowa State University, Ames, IA, USA

4:45 T24 • Development and Testing of a Method for the Detection of Moulds Using the MicroFoss System–N. Beales, R. P. BETTS, S. McDougal, and R. Firstenberg-Eden, Campden and Chorleywood Food Research Association, Gloucestershire, UK

P02 General Food Microbiology – Exhibit Hall, Manchester Ballroom

3:00 p.m.–6:00 p.m.
(Authors present 3:30 p.m.–5:30 p.m.)

Convenors: Kali Kniel and Brian Yaun

P52 • Colonization Property of *Lactobacillus reuteri* and Its Antagonistic Activity in Mice Infected with *Salmonella enterica* serovar Typhimurium DT104–SO HYUN KIM, Nam Hoon Kwon, Ji Yeon Kim, Ji Youn Lim, Jong Hwan Park, Jun Man Kim, WonKi Bae, Kyoung Min Noh, Jin Hur, Woo Kyung Jung, Sook Shin, Byung Woo Yoo, and Yong Ho Park, Seoul National University, Suwon, Gyunggi, Korea

P53 • Quantitative Contamination and Transfer from Foods of *Escherichia coli* by Houseflies—ANTONIO J. DE JESUS, Richard C. Whiting, Alan Olsen, and John Bryce, FDA-CFSAN, College Park, MD, USA

P54 • Survival and Growth of *Listeria monocytogenes* in Stored (4°, 15° or 25°C) Infant Cereal Hydrated with Water, Milk or Apple Juice—A. Abushelaibi, J. Samelis, P. A. Kendall and J. N. SOFOS, Colorado State University, Ft. Collins, CO, USA

P55 • Growth Potential of *Listeria monocytogenes* in Commercially Prepared Ready-to-eat Deli Salads Stored at Refrigeration Temperatures—BRIAN S. EBLEN, Richard C. Whiting and Arthur J. Miller, FDA-CFSAN, College Park, MD, USA

P56 • Evaluation of Coliforms in Bottled Water at Xalapa City, Veracruz, Mexico—PAOLA SABINA CONTRERAS ROMO, Laboratorio de Alta Tecnología de Xalapa, S.C., Xalapa, Veracruz, Mexico

P57 • Assessment of Risks Associated with Consumer Food Handling Practices Using Real-Time Microbiological Analysis—E. C. REDMOND, C. J. Griffith, J. Slader, and T. J. Humphrey, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P58 • Plant Metabolites Inhibit Growth and Enterotoxin Production of *Vibrio cholerae*—NORMA HEREDIA, Santos Garcia, and Ginebra Alarcon, Universidad Autonoma de Nuevo Leon, San Nicolas, N.L., Mexico

P59 • Adaptation of *Vibrio cholerae* to Acidic and Bile Juice after Sublethal Shock—GENOVEVA ALVAREZ, Norma Heredia, and Santos García, Universidad Autónoma de Nuevo León, San Nicolás, N.L., Mexico

P60 • *Haematoxylon brasiletto* Extracts Inhibit Growth, Verotoxin Production and Adhesion of *Escherichia coli* O157:H7—SANTOS GARCIA, Marco Escobar and Norma Heredia, Universidad Autónoma de Nuevo León, San Nicolás, N.L., Mexico

P61 • Synergistic Effect of Eugenol, Vanillin and Potassium Sorbate Combinations to Inhibit Growth of *Aspergillus flavus*—M. Teresa Jimenez-Munguia, Enrique Palou and AURELIO LÓPEZ-MALO, Universidad de las Américas-Puebla, Puebla, Mexico

P62 • The Role of Exopolysaccharide in Protecting *Escherichia coli* O157:H7 from Acidic Conditions in Set and Stirred Yogurt—SHIAO MEI LEE and Jinru Chen, University of Georgia, Griffin, GA, USA

P63 • *Debaryomyces hansenii* Growth/No Growth Interface as Affected by Solute and Acid Type Used to Adjust a_w and pH—ENRIQUE PALOU and Aurelio López-Malo, Universidad de las Américas-Puebla, Puebla, Mexico

P64 • Death of Pathogenic Bacteria in Yellow Fat Spreads, Margarine, and Toppings as Affected by Temperature—Sarah L. Holliday and LARRY R. BEUCHAT, University of Georgia, Griffin, GA, USA

P65 • Advantages and Limitations of a Multiple Hurdle System to Control Food Pathogens and Food Spoilage Organisms—CLAUDIA KOERTING and Carey Walker, University of Connecticut, Storrs, CT, USA

P66 • Microbial Quality of Groundwater in a Shallow Aquifer Following Hog Manure Application to an Overlying Field—J. Rogasky, G. BLANK, R. Holley, and B. Betcher, University of Manitoba, Winnipeg, Manitoba, Canada

P67 • Combined Effects of Carbon Dioxide and Temperature in High Pressure Processing of Fluid Food Systems—V. M. (Bala) Balasubramaniam, Sue Keller, Joe Dunn, OMAR MARTIN, and Armand Paradis, Illinois Institute of Technology, Summit-Argo, IL, USA

P68 • A Composite Model for Prediction of Bacterial Destruction in Antimicrobial Treatment of Vegetables—HONG YANG, Betty L. Swem, Hong Wang and Yanbin Li, University of Arkansas, Fayetteville, AR, USA

P69 • HAV Resistance in Mussels Subjected to Different Kinds of Domestic Cooking—CROCI LUCIANA, Dario De Medici, Simona Di Pasquale, Elisabetta Suffredini, and Laura Toti, Istituto Superiore di Sanità - Laboratorio Alimenti, Rome, Italy

P70 • GIS and *Listeria* Isolates Recovered from Dairy Cows, Calves, and Farm Environments—K. D. LAMAR, M. Evans, V. Ling, S. P. Oliver, D. A. Golden, and F. A. Draughon, University of Tennessee-Knoxville, Knoxville, TN, USA

P71 • An Australian Survey of the Incidence of *Listeria* in Ready-to-eat Co-mingled Food Samples—JILL GEBLER and Sharon Savory, Murray Goulburn Co-op Co. Ltd., Yarram, Victoria, Australia

P72 • Antibiotic Resistance of *Salmonella* Isolated from Imported Food—SHAOHUA ZHAO, David D. White, Atin R. Datta, Sherry Ayers, Sharon Friedman, and Robert D. Walker, USFDA, Laurel, MD, USA

P73 • Acid Tolerance of Susceptible and Multi-antimicrobial Resistant *Salmonella* Cultures Prepared under Acid Stressing Conditions—R. T. BACON, J. N. Sofos, P. A. Kendall, K. E. Belk, and G. C. Smith, Colorado State University, Ft. Collins, CO, USA

P74 • Thermal Inactivation of Susceptible and Multi-antimicrobial Resistant *Salmonella* Grown in the Absence or Presence of Glucose—R. T. BACON, J. N. Sofos, P. A. Kendall, J. R. Ransom, K. E. Belk, and G. C. Smith, Colorado State University, Ft. Collins, CO, USA

P75 • Genotypic Diversity of *Listeria* Isolates from Dairy Cows, Calves, and the Farm Environment—MATTHEW R. EVANS, F. A. Draughon, S. P. Oliver, and V. Ling, The University of Tennessee-Knoxville, Knoxville, TN, USA

P76 • Simultaneous Detection of Hepatitis A Virus and Human Rotavirus Using Colorimetric Biplex Nucleic Acid Sequence-based Amplification (NASBA)—Enzyme-Linked Immunosorbent Assay—JULIE JEAN, Burton Blais, André Darveau, and Ismail Fliss, Univeriste Laval, Quebec, Canada

P77 • Antimicrobial Activity and Mechanisms of Action of Essential Oils and Components—VALERIE W. LING, Katie Davenport, P. Michael Davidson, and F. Ann Draughon, University of Tennessee, Knoxville, TN, USA

P78 • Distribution of Environmental and Disease Associated *Listeria monocytogenes* Biofilm Phenotypes within rep-PCR Genotype Patterns—JAMES FOLSOM, Gregory Siragusa, and Joseph Frank, University of Georgia, Athens, GA, USA

P79 • Withdrawn

P80 • Bias and Accuracy Values from Ten Years of Predictive Food Microbiology Literature—SIOBAIN DUFFY and Donald W. Schaffner, Yale University, New Haven, CT, USA

P81 • Statistical Distributions Describing Microbial Quality of Surfaces and Foods in a Foodservice Operation—REBECCA MONTVILLE and Don Schaffner, Rutgers University, New Brunswick, NJ, USA

P82 • Modified RT-PCR to Eliminate False Positive RT-PCR with Inactivated Viruses—SUPHACHAI NUANUALSUWAN, Sakchai Himathongkham, Hans Riemann, MingQi Deng, and Dean Cliver, University of California-Davis, Davis, CA, USA

P83 • Effect of *Lactobacillus rhamnosus* and a Fermented Milk on the Growth of *Aspergillus* and *Penicillium* Species—JITKA STILES, Valerie Carter, and Lloyd B. Bullerman, University of Nebraska-Lincoln, Lincoln, NE, USA

P84 • Formation of Volatile Compounds by Wild Strains of *Lactococcus lactis* Isolated from Raw Ewes' Milk Cheese—Pilar Morales, Estrella Fernandez-Garcia, Pilar Gaya, Margarita Medina, and MANUEL NUÑEZ, Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Madrid, Spain

P85 • Factors Affecting Inhibition of *Listeria monocytogenes* in Milk by Nisin—MEENA BHATTI and Leora A. Shelef, Wayne State University, Detroit, MI, USA

P86 • The Effect of Bacteriocin-producing *Lactococcus lactis* subsp. *lactis* INIA 415 as Adjunct Culture on Proteolysis and Flavor of a Semi-Hard Cheese—Sonia Garde, Javier Tomillo, Pilar Gaya, Margarita Medina, and MANUEL NUÑEZ, Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria, Madrid, Spain

P87 • Validation of SL-Beta-lactam Test Performance in Goats' Milk—ROBERT S. SALTER, Mary Bulthaus, Frank Fillman, Bob Bonifacio, Phil Kijac, Charm Sciences, Inc., Lawrence, MA, USA

P88 • Virulence Attributes of *Escherichia coli* O157:H7 Isolated from Dairies in East Tennessee—PAUL D. EBNER, Shelton E. Murinda, Barbara E. Gillespie, Stephen P. Oliver and Alan G. Mathew, University of Tennessee, Knoxville, TN, USA

P89 • Incidence of *Brucella* spp., *Listeria* spp. and *Escherichia coli* O157:H7 in Raw Milk from Jalisco State, Mexico—E. CABRERA-DÍAZ, G. Partida-Gutiérrez, R. C. Olivares-Cruz, and M. R. Torres-Vitela, University of Guadalajara, Guadalajara, Jalisco, Mexico

P90 • The Use of Ionizable Zinc to Increase the Efficacy of a Chlorhexidine Disinfectant Used in Mastitis Control—Geoffrey Westfall, CLAUDIA KOERTING, and Lynn Hinckley, University of Connecticut, Storrs, CT, USA

P91 • A Rapid Screening Method to Test for Alkaline Phosphatase Activity in Cheese—KEN J. YOSHITOMI, FDA, Bothell, WA, USA

TUESDAY MORNING — JULY 2, 2002

8:30 a.m. — 12:00 p.m.

S09 Cooperating to Improve Foodborne Outbreak Investigations

— Manchester Ballroom A-B

Sponsored by IAFP Foundation Fund

Organizer: Kali Kniel

Convenors: Kali Kniel and Marcos Sanchez

8:30 • Foodborne Outbreaks: Roles and Responsibilities—JACK GUZEWICH, FDA, College Park, MD, USA

9:00 • Overview of Surveillance and Epidemiological Investigations—ROB V. TAUXE, CDC, Atlanta, GA, USA

9:30 • Two Recent Examples of an Epidemiological Investigations of Foodborne Outbreaks—To be determined

10:10 • Break

10:40 • Overview of Environmental Investigations—JEFF FARRAR, California Dept. of Health Services, Sacramento, CA, USA

11:10 • Recent Examples of Environmental Investigations of Foodborne Outbreaks—MARY PALUMBO, California Dept. of Health Services, Sacramento, CA, USA

11:30 • The Food Safety System: Past Accomplishments and Future Efforts to Improve Foodborne Outbreak Investigations—MINDY BRASHEARS, Texas Tech University, Lubbock, TX, USA

S10 **Integrated Approaches for the Study and Control of Foodborne Pathogens in Meat and Poultry** – Regency Ballroom A-B

Sponsored by IAFP Foundation Fund and Walt Disney World Co.

Organizer: Ruff Lowman

Convenors: Roger L. Cook and Ruff Lowman

8:30 • Iceland *Campylobacter* Project: Sources and Risk Factors for *Campylobacter* in Poultry and Impact on Human Disease in a Closed System — Microbiology and Molecular Typing–NORMAN STERN, USDA-ARS, Athens, GA, USA

8:45 • Iceland *Campylobacter* Project: Sources and Risk Factors for *Campylobacter* in Poultry and Impact on Human Disease in a Closed System – Epidemiological and Spatial Analysis–PASCAL MICHEL, Health Canada, St-Hyacinthe, Quebec, Canada

9:00 • Iceland *Campylobacter* Project: Sources and Risk Factors for *Campylobacter* in Poultry and Impact on Human Disease in a Closed System – Systems Modelling–GREG PAOLI, Decisionalysis Risk Consultants, Inc., Ottawa, Ontario, Canada

9:15 • Integrated Approach to Zoonotic Disease Research in New Zealand–ROGER L. COOK, Ministry of Agriculture and Forestry, Wellington, New Zealand

10:00 • Break

10:30 • Research into the Role of Feed and Water Hygiene in Pre-harvest Food Safety–DALE HANCOCK, Washington State University, Pullman, WA, USA

11:15 • *Salmonella* Control in Swine, Food Safety Perspectives and Impact on the Swine Industry in Denmark–VIBEKE MØGELMOSE, Danish Bacon and Meat Council, Copenhagen, Denmark

S11 ***Listeria* Research Update** – Regency Ballroom C

Sponsored by ILSI N.A.

Organizer: Catherine Nnoka

Convenors: Karen D. Huether and Bala Swaminathan

8:30 • Use of Sequence Typing for Characterization of Virulence Factors and for the Development of a Novel Molecular Typing Scheme for *Listeria monocytogenes*–JEFFREY M. FARBER, Health Canada, Ottawa, Ontario, Canada

9:00 • Identification of Potentially Unique Genetic Markers and Virulence Attributes of Epidemic-associated Strains of *Listeria monocytogenes*–SOPHIA KATHARIOU, North Carolina State University, Raleigh, NC, USA

9:30 • Molecular and Phenotypic Characterization of *Listeria monocytogenes* Isolates from Humans and Foods to Define Human Pathogenic Strains–MARTIN WIEDMANN, Cornell University, Ithaca, NY, USA

10:00 • Break

10:30 • Rapid Nucleic Acid-based Detection and Enumeration of *Listeria monocytogenes* by Flow Cytometry–BYRON BREHM-STECHER, University of Wisconsin-Madison, Madison, WI, USA

11:00 • Summary of the Key Points of the Presentations–BALA SWAMINATHAN, CDC, Atlanta, GA, USA

11:30 • Panel Discussion

S12 **Current Issues in Seafood Safety** – Cunningham Room

Sponsored by IAFP Foundation Fund

Organizers: Linda S. Andrews, Angelo DePaola, and Douglas L. Marshall

Convenors: Linda S. Andrews and Douglas L. Marshall

8:30 • Epidemiology of Seafood Diseases–LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

9:00 • Risk Characterization of *Vibrio parahaemolyticus* in Raw Oysters–MARIANNE MILIOTIS, FDA-CFSAN-DVA-VMB, Washington, D.C., USA

9:30 • Processing Strategies to Reduce *Vibrios* in Raw Oysters–LINDA S. ANDREWS, Mississippi State University, Biloxi, MS, USA

10:00 • Break

10:30 • Control of *Listeria monocytogenes* in Ready-to-eat Seafood–LISBETH TRUELSTRUP HANSEN, Canadian Institute of Fisheries Technology, Halifax, NS, Canada

11:00 • Chemical Contaminants in Fish–RITA SCHOENY, US Environmental Protection Agency, Washington, D.C., USA

11:30 • Analytical Perspective on the Prevention of Neurotoxic Shellfish Poisoning–ROBERT W. DICKEY, FDA, Gulf Coast Seafood Laboratory, Dauphin Island, AL, USA

T03 **GMOs and Produce** – Regency Ballroom D-E

8:30 T25 • The Impact of Biotechnology on the Foodservice Industry–SHEILA COHN, National Restaurant Association, Washington, D.C., USA

8:45 T26 • What Can We Learn about Biotechnology from the Retail Food Industry Experiences? –SUSAN HARLANDER, BIOrational Consultants, Inc., New Brighton, MN, USA

9:00 T27 • A Farm to Fork Case Study in Risk Communication – The Model Farm Project, Year 2–KATIJA A. BLAINE, Douglas A. Powell, and Jeffrey Wilson, University of Guelph, Guelph, ON, Canada

9:15 T28 • Needs Assessment for a Proposed Biotechnology Education Initiative for Ontario High School Biology Students–LIZ GOMES and Douglas Powell, University of Guelph, Guelph, ON, Canada

9:30 T29 • Public Attitudes toward Genetically Modified Foods—CHRISTINE BRUHN, University of California-Davis, Davis, CA, USA

9:45 • Break

10:15 T30 • Response to an Outbreak of Salmonellosis Associated with California Almonds—S. ISAACS, J. Aramini, B. Ciebin, J. Farrar, R. Ahmed, D. Middleton, E. Chan, S. Pichette, K. Campbell, P. Mead, L. Lior, M. Pearce, C. Clark, F. Rogers, F. Jamieson, I. Brophy, A. Ellis, Health Canada, Guelph, Ontario, Canada

10:30 T31 • Overcoming Barriers When Implementing an On-farm Food Safety Program: A Case Study of the Ontario Greenhouse Vegetable Growers—AMBER LUEDTKE, Benjamin Chapman, Douglas Powell, and all of the Food Safety Network, University of Guelph, Guelph, Ontario, Canada

10:45 T32 • Evaluation of the Use of Lactic Acid Bacteria to Control Pathogens on Alfalfa Sprouts—MARSHA R. HARRIS, Mindy M. Brashears, and Durward A. Smith, University of Nebraska-Lincoln, Lincoln, NE, USA

11:00 T33 • A Survey of Sprout Growers in California JENNIFER THOMAS, Mary Palumbo, Dean Cliver, Jeff Farrar, and Thomas Farver, California Dept. of Health Services, Sacramento, CA, USA

11:15 T34 • Proteolytic Activity of Fungi Isolated from Decayed and Damaged Tomatoes—WENDY N. WADE and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

11:30 T35 • The Use of Oxidation to Control *Cryptosporidium* Infectivity—K. KNIEL, S. S. Sumner, D. S. Lindsay, C. R. Hackney, M. D. Pierson, A. Zajac, and D. A. Golden, Virginia Tech., Blacksburg, VA, USA

11:45 T36 • Proximity to Dairy Operations Influences the Presence of a Fecal Indicator on Peaches, Plums, and Nectarines—Shantana Goerge, Lorena Fernandez, and TREVOR SUSLOW, University of California-Davis, Davis, CA, USA

P03 Produce, Meat, and Seafood Microbiology

— Exhibit Hall, Manchester Ballroom

10:00 a.m.—1:00 p.m.
(Authors present 10:30 a.m.—12:30 p.m.)

Convenors: Renee Raiden and Brooke Seeman

P92 • Effect of Superoxidized Water and Hypochlorite Solutions on the Survival of *Escherichia coli* on Capsicum Fruit—HUGH MARTIN and Jean Taylor, Royal Agricultural College, Stroud Road, Cirencester, Gloucestershire, UK

P93 • Survival of *Escherichia coli* O157:H7 and *Salmonella* Muenchen on Apples as Affected by Application of Commercial Fruit Waxes—STEPHEN J. KENNEY and Larry R. Beuchat, University of Georgia, Athens, GA, USA

P94 • Preharvest Assessment of *Salmonella* spp. Contamination of Outer Rind of Cantaloupes in California—TREVOR SUSLOW, Marcella Zuñiga, Lorena Fernandez, and Bradley Butterfield, University of California-Davis, Davis, CA, USA

P95 • Inactivation of *Salmonella* during Drying of Roma Tomatoes Treated with Organic Acids—Y. YOON, P. A. Kendall and J. N. Sofos, Colorado State University, Ft. Collins, CO, USA

P96 • Assessment of the Viral Quality of Reclaimed Wastewater for Food Crop Irrigation—DIMA KAYED, Pablo Gortares, Martin M. Karpiscak, Robert P. Freitas, Ralph Meer, and Charles P. Gerba, University of Arizona, Tucson, AZ, USA

P97 • Reduction of *Escherichia coli* O157:H7 on Alfalfa Seeds Following Exposure to Trans-2-Nonenal—M. AUCHTER and M. C. Newman, University of Kentucky, Lexington, KY, USA

P98 • Comparision of Subsurface and Furrow Irrigation in the Viral Contamination of Iceberg Lettuce—SCOTT STINE, Inhong Song, Faezah Manshadi, Jose Pimentel, Christopher Y. Choi, and Charles P. Gerba, University of Arizona, Tucson, AZ, USA

P99 • *Salmonella* Enteritidis Infections Associated with Mung Bean Sprouts, California, 2000—J. C. MOHLE-BOETANI, J. Farrar, P. Bradley, M. Miller, K. Cummings, and S. B. Werner, California Dept. of Health Services, Berkeley, CA, USA

P100 • Inactivation of GFP-Transformed *Escherichia coli* O157:H7 by Sanitizers on Lettuce and Strawberries as Determined by Confocal Scanning Laser Microscopy—STEPHANIE L. RODGERS, Joanne H. Whallon, and Elliot T. Ryser, Michigan State University, East Lansing, MI, USA

P101 • An Outbreak of *Salmonella* Serotype Kottbus Infections Associated with Raw Alfalfa Sprouts—K. L. Winthrop, M. S. PALUMBO, J. A. Farrar, J. Mohle-Boetani, S. Abbott, G. Inami, and S. B. Werner, California Dept. of Health Services, Sacramento, CA, USA

P102 • Survival and Growth of *Salmonella* spp. on Fresh-cut Cantaloupe Cubes and Rind Following Electron Beam Irradiation—AUBREY MENDONCA, Maria Romero, Ainura Orozalieva, and Floyd Woods, Iowa State University, Ames, IA, USA

P103 • Inactivation of *Salmonella* during Drying and Storage of Gala Apples Treated with Acid or Sodium Metabisulfite Solutions—Patricia Di Persio, P. A. Kendall, M. Calicioglu, and J. N. SOFOS, Colorado State University, Ft. Collins, CO, USA

P104 • Attraction of a Free-living Nematode, *Caenorhabditis elegans*, to *Escherichia coli* O157:H7 and *Salmonella*, and Its Potential as a Vector for Preharvest Contamination of Fruits and Vegetables—KRISHAUN N. CALDWELL, Gary L. Anderson, Phillip L. Williams, and Larry R. Beuchat, University of Georgia, Griffin, GA, USA

(Tuesday a.m., *continued*)

P105 • Cross-contamination of Lettuce by *Escherichia coli* O157:H7 via Contaminated Ground Beef—MARIAN R. WACHTEL, James L. Mc Evoy, Yaguang Luo, Anisha Williams-Campbell, and Morse B. Solomon, USDA-ARS-BARC-W, Beltsville, MD, USA

P106 • The Microbiological Examination of Prepared Ready-to-eat Salad Vegetables from Retail and Catering Premises in the United Kingdom—CHRISTINE L. LITTLE, Satnam K. Sagoo, and Robert T. Mitchell, Public Health Laboratory Service, London, UK

P107 • Passage of *Escherichia coli* O157:H7 from Contaminated Water to Lettuce is Dependent on Irrigation Methodology—ETHAN B. SOLOMON and Karl R. Matthews, Rutgers University, New Brunswick, NJ, USA

P108 • Effect of Acid Adaption on Inactivation of *Escherichia coli* O157:H7 during Drying of Apple Slices—Suman Priya Lakkakula, PATRICIA A. KENDALL, John Samelis, and John N. Sofos, Colorado State University, Ft. Collins, CO, USA

P109 • Inhibition of Sprout Pathogenic Fungi Growth Using Allyl Isothiocyanate Vapor—KANAKO FURUYA, Shigeo Miyao, and Kenji Isshiki, Daikin Environmental Laboratory, Limited, Tsukuba, Ibaraki, Japan

P110 • Reduction of *Escherichia coli* K12 on Alfalfa Seeds by Supercritical Carbon Dioxide Treatment—Angela M. Mazzoni, ALI DEMIRCI, Gregory R. Ziegler, and Ratna R. Sharma, Pennsylvania State University, University Park, PA, USA

P111 • Efficacy of Chlorine and Calcinated Calcium Treatment of Alfalfa Seeds and Sprouts to Eliminate *Salmonella*—MEGHA GANDHI and Karl R. Matthews, Rutgers, The State University of New Jersey, Cook College, New Brunswick, NJ, USA

P112 • Inactivation of *Escherichia coli* O157:H7 on Alfalfa Seeds and Sprouts by Ozonation—Ratna R. Sharma, ALI DEMIRCI, Larry R. Beuchat, and William F. Fett, Pennsylvania State University, University Park, PA, USA

P113 • VUV-C Destruction of *Salmonella* spp. and *Escherichia coli* O157:H7 on the Surface of Agar and Fresh Produce—B. R. YAUN, S. S. Sumner, J. D. Eifert, and J. E. Marcy, Virginia Tech., Blacksburg, VA, USA

P114 • Influence of Calcium Lactate on the Fate of Pathogenic and Spoilage Microorganisms in Orange Juice—JINRU CHEN, Joy G. Adams, and Jui-Yueh Yeh, CFS, University of Georgia, Griffin, GA, USA

P115 • Evidence of *Salmonella* Internalization into Fresh Mangoes during Simulated Post Harvesting Procedures—Ana L. Penteado, BRIAN S. EBLEN, and Arthur J. Miller, CFSAN-FDA, College Park, MD, USA

P116 • Screening of Potential Bacterial Pathogen Surrogates for Antibiotic Resistance—ARUNA PERI, Claudia Rodriguez, Nicole Maks, Jodie Ulaszek, Susanne Keller, Sadhana Ravishankar and Peter Slade, The National Center for Food Safety and Technology, Summit-Argo, IL, USA

P117 • Incidence and Growth of *Salmonella* and *Listeria* in Melon—ANA LUCIA PENTEADO and Mauro Farber Freitas Leitao, State University of Campinas, Campinas, São Pāulo, Brazil

P118 • Evaluation of Factors that Influence the Recovery of *Listeria monocytogenes* from Lettuce Treated with Sanitizers—Andrea B. Burnett, Montserrat H. Iturriaga, Eduardo F. Escartin, Charles A. Pettigrew, and LARRY R. BEUCHAT, University of Georgia, Griffin, GA, USA

P119 • A Receptor Assay for the Detection of Sulfamonomethoxine and Sulfadimethoxine Residue in Live Pigs—S. H. LEE, S. J. Park, H. Lee, H. J. Lee, C. C. Chae, Y. Jin, J. H. Choi and M. H. Lee, College of Agriculture and Life Sciences, Seoul National University, Suwon, Kyonggi-do, South Korea

P120 • National Animal Health Monitoring System Swine 2000: A Surveillance Study of *Escherichia coli* O157 in Swine—INGRID FEDER, Jeffrey T. Gray, Rachel Pearce, Eric Bush, Pina Fratamico, F. Morgan Wallace, Anna Porto, Paula Fedorka-Cray, Richard Perrine, Robert Dudley, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P121 • Evaluation of Enrichment Methods for Recovery of *Yersinia enterocolitica* O:3 and O:8 from Swine Feeds—JOO-SUNG KIM, Alan Mathew, and F. Ann Draughon, The University of Tennessee Food Safety Center of Excellence, Knoxville, TN, USA

P122 • Genomic Fingerprinting of *Salmonella* Recovered from Swine Carcass and Fecal Samples at a Slaughterhouse—LAURA WONDERLING, Rachel Pearce, F. Morgan Wallace, Jeffrey E. Call, Mark Tamplin, Robert Dudley, Ingrid Feder, Samuel Palumbo, Alan Oser, Lisa Yoder, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P123 • Evaluation of Methods for Recovery of *Salmonella* from Swine Feces—PHILIPUS PANGLOLI, F. Ann Draughon, Alan Mathew, and Omaima Ahmed, The University of Tennessee, Food Safety Center of Excellence, Knoxville, TN, USA

P124 • Examination of Class I Integrons in *Escherichia coli* Isolated from Pigs on US Swine Farms that Use or Exclude Antibiotics—PAUL D. EBNER and Alan G. Mathew, University of Tennessee, Knoxville, TN, USA

P125 • Prevalence of *Trichinella* sp. in Farmed Wild Boars in Alberta—JOHN T. Y. WU, Ken H. Dies, Eva Y. W. Chow, Evelyn E. Bowlby, and Lester S. Y. Wong, Alberta Agriculture Food and Rural Development, Edmonton, Alberta, Canada

P126 • Screening for Cephalosporins Plasma Residues in Live Pigs by Receptor Assay—S. J. Park, S. H. LEE, H. Lee, H. J. Lee, C. C. Chae, Y. Jin, J. H. Choi and M. H. Lee, Seoul National University, Suwon, Kyonggi-do, South Korea

P127 • Enzyme-linked Immunosorbent Assay for the Detection of Sulfamonomethoxine and Sulfadimethoxine Residue in Live Pigs—S. H. LEE, S. J. Park, H. Lee, H. J. Lee, C. C. Chae, Y. Jin, J. H. Choi and M. H. Lee, Seoul National University, Suwon, Kyonggi-do, South Korea

P128 • A Comparison and Development of Isolation Protocols for Recovery of *Escherichia coli* O157:H7 from Swine Feces—PHILIPUS PANGLOLI, F. Ann Draughon, David Golden, Alan Mathew, and Omaima Ahmed, The University of Tennessee, Knoxville, TN, USA

P129 • Influence of pH on Retail Shelflife of Pork—B. L. KNOX, R. L. J. M. van Laack, P. M. Davidson, E. Spencer, and R. E. Klont, University of Tennessee, Knoxville, TN, USA

P130 • The Impact of Starvation on the Resistance of *Salmonella* Typhimurium to Irradiation in 0.85% Saline and in Ground Pork—AUBREY MENDONCA, Maria Romero, and Makuba Lihono, Iowa State University, Ames, IA, USA

P131 • Detection and Enumeration of *Listeria monocytogenes* in Battered and Breaded Seafood—FLETCHER ARRITT, Joseph Eifert, and Michael Jahncke, Virginia Tech., Blacksburg, VA, USA

P132 • The Fate of *Escherichia coli* O157:H7 on Channel Catfish Fillets with and without Skin Packaged under Modified Atmosphere—RICO SUHALIM and Yao-wen Huang, The University of Georgia, Athens, GA, USA

P133 • Microbial Validation of Sous Vide-like Cooking Process for Lamb in Curry Sauce—L. S. VANDERWAL, H. Thippareddi, C. L. Kastner, R. J. Danler, P. Udomvarapont, D. H. Kropf, R. K. Phebus, and E. A. Boyle, Kansas State University, Manhattan, KS, USA

P134 • Human BSE Exposure Risk and Direct Detection of Abnormal Prion Protein in Meat Products—E. LÜCKER, M. Hardt, and M. H. Groschup, University of Leipzig, Leipzig, Germany

P135 • The Role of the SigB Gene in Stress Survival of *Listeria monocytogenes* Strains of Meat and Clinical Origin—SANDRA M. MOORHEAD and Gary A. Dykes, AgResearch, Hamilton, New Zealand

P136 • Genotypic Variability and Antibiotic Resistance Profiles of *Escherichia coli* O157:H7 Isolates from Downer and Healthy Dairy Cattle—CAITRIONA M. BYRNE, Irfan Erol, Jeffrey E. Call, Dennis Buege, Charles W. Kaspar, Clayton Hiemke, Paula Fedorka-Cray, Jovita Hermosillo, Takiyah Ball, Andrew K. Benson, Morgan Wallace, Marcus Handy, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P137 • Dried Distiller's Grains with Solubles in Finishing Cattle Diets: A Preharvest Strategy against Acid Resistant *Escherichia coli* and Coliforms—MICHELLE GORDON, R. K. Phebus, J. S. Drouillard, H. Thippareddi, D. L. Lambert, K. Kerr, N. Pike, J. J. Sindt, and J. J. Higgins, Kansas State University, Manhattan, KS, USA

P138 • Characterization of *Escherichia coli* O157 Isolated from Slaughterhouses and Retail Stores in Korea—JI YEON KIM, Won ki Bae, So Hyun Kim, Nam Hoon Kwon, Ji Youn Lim, Jun Man Kim, Kyoung Min Noh, Woo Kyoung Jung, and Yong Ho Park, Seoul National University, Suwon, Gyunggi, Korea

P139 • Preparation of Ground Beef Samples for Detecting *Escherichia coli* O157:H7 by PCR—SHENGHUI CUI and Jiang Hong Meng, University of Maryland, College Park, MD, USA

P140 • Vancomycin Resistant Enterococci Possessing vanA Gene Isolated from Beef Imported to Malaysia—NIMITA FIFADARA, Gulam Rusul, Son Radu, Zaiton Hassan, and Larry R. Beuchat, University Putra Malaysia, Serdang, Selangor, D.C., Malaysia

P141 • Identification of Spoilage Microorganisms in Ground Beef Treated with Diacetyl and Hydrodynamic Pressure Processing, Alone or in Combination—CHERYL MUDD, Anisha Williams-Campbell, and Morse Solomon, USDA-ARS, Beltsville, MD, USA

TUESDAY AFTERNOON – JULY 2, 2002

1:30 p.m. – 3:30 p.m.

S13 **Controlling *Clostridium perfringens* Hazards during Cooling** – Regency Ballroom A-B

Organizers: Vijay K. Juneja and Don Schaffner

Convenors: Vijay K. Juneja and Sadhana Ravishankar

1:30 • Characteristics of *Clostridium perfringens* in Food Safety—JOHN S. NOVAK, USDA-ARS-ERRC, Wyndmoor, PA, USA

1:50 • Safe Cooling of Meats and Retail Foods: An Industry Perspective—O. PETER SNYDER, Hospitality Institute of Technology and Management, St. Paul, MN, USA

2:15 • Stabilization Performance Standards: An Industry Response—H. THIPPAREDDI, Kansas State University, Manhattan, KS, USA

2:40 • Predictive Models for *Clostridium perfringens* Applicable to Cooling—VIJAY K. JUNEJA, USDA-ARS-ERRC, Wyndmoor, PA, USA

3:05 • Risk Assessment of *Clostridium perfringens* during Cooling of Cooked Meats—AAMIR FAZIL, Health Canada, Guelph, Ontario, Canada

(Tuesday p.m., *continued*)

S14 Innovations in Retail Food Safety Management Systems and Technology – Regency Ballroom C

Sponsored by Walt Disney World Co.

Organizer: Susan Sumner

Convenors: Al Fain and Mary Anne Hogue

1:30 • Essentials of Retail HACCP–FRED REIMERS, HEB Quality Assurance, San Antonio, TX, USA

1:50 • Innovations in Restaurant Food Safety and Quality Assurance in a Challenging Global Environment–TOM CHESTNUT, Darden Restaurant Inc., Orlando, FL, USA

2:20 • Influence of Regulations on Innovations–RICHARD BARNES, FDA, Rockville, MD, USA

2:40 • Retail Food Safety Training–CAMERON R. HACKNEY, West Virginia University, Morgantown, WV, USA

3:00 • Food Safety Tools and Management Systems–CHRISTOPHER BOYLES, Steritech Group Inc., Charlotte, NC, USA

S15 Alternatives in Dairy Waste Management: Create New Products or Generate Power! – Cunningham Room

Organizers/Convenors: Marc Bates and Stephanie Olmsted

1:30 • Technical Solutions for Liquid/Solids Separation–MARK FOSSHAGEE, World Water Works, Edgewater, NJ, USA

2:00 • Product Recovery - Keeping Dairy from Going Down the Drain–MARK D. JOHNSON, Gannett Fleming, Malden, MA, USA and CLAY DETLEFSEN, International Dairy Foods Association, Washington, D.C., USA

2:30 • Methane to Money – California's Dairy Power Production Program–MICHAEL MARSH, Western United Dairymen, Modesto, CA, USA

3:00 • Integrating Life Cycle Analyses into Dairy Systems to Close Nutrient-Waste-Pathogen Cycles–F. MICHAEL BYERS, USDA, Beltsville, MD, USA

T04 Public Health and Outbreaks – Regency Ballroom D-E

1:30 T37 • Environmental Health Specialists Network (EHS-Net) - Understanding the Causes of Foodborne Illness and Improving the Practice of Environmental Health–ROBIN LEE, Craig Hedberg, Daniela Niutta, Carol Selman, and the EHS-Net Working Group, CDC-NCEH, Atlanta, GA, USA

1:45 T38 • Staphylococcal Food Poisoning: Phenotypic and Genotypic Characterization of Isolates from Food and Human Samples–Viviane Colombari, Mariana D. B. Mayer, Zaira M. Laicini, Elza M. Mamizuka, Bernadette D. G. M. Franco, MARIA T. DESTRO, and Mariza Landgraf, University of São Pãulo - Brazil, São Pãulo, Brazil

2:00 T39 • Epidemiological Typing of *Campylobacter* Clinical and Food Isolates Using Pulsed-Field Gel Electrophoresis (PFGE) – DIANE MEDEIROS, Jeff Farber, and Syed Sattar, Bureau of Microbial Hazards, Food Directorate, Health Products and Food Branch, Ottawa, Ontario, Canada

2:15 T40 • Dose Response Modelling of *Escherichia coli* O157 Incorporating Data from Foodborne and Environmental Outbreaks–N. J. C. STRACHAN and I. D. Ogden, University of Aberdeen, Aberdeen, UK

2:30 T41 • An Analysis of US Cross-connection Incidents in the Food Industry: 1901-2000–PAULA MARIE TANNER and P. J. E. Quintana, Jack-in-the-Box Corporate Headquarters, San Diego, CA, USA

2:45 T42 • Implications of Flies, Pathogens and Public Health Risks–JERRY BUTLER, James Maruniak, and Frank Meek, University of Florida, Gainesville, FL, USA

Lecture Topics – Manchester Ballroom A-B

Organizer/Convenor: Anna Lammerding

- 1:30 p.m.–2:30 p.m.
  ICMSF Lecture on Microbiological Sampling Plans–SUSANNE DAHMS, Institute of Biometrics and Data Processing, Berlin, Germany
- 2:30 p.m.–3:30 p.m.
  Risk Assessment of Microbiological Hazards in Foods: An International Approach–SARAH CAHILL, Food and Agriculture Organization, Rome, Italy; PETER KARIM BEN EMBAREK, World Health Organization, Geneva, Switzerland

Business Meeting (4:00 p.m.–5:00 p.m.) – Manchester Ballroom A-B

WEDNESDAY MORNING – JULY 3, 2002
8:30 a.m. – 12:00 p.m.

S16 Chronic Wasting Disease and Other Transmissible Spongiform Encephalopathies – Manchester Ballroom A-B

Sponsored by ILSI N.A. in partnership with the International Food Information Council

Organizer: Catherine Nnoka

Convenors: Robert E. Brackett and John G. Cerveny

8:30 • Overview of TSEs–DEAN O. CLIVER, University of California, Davis, CA, USA

9:00 • CWD Detection Methods–KATHERINE O'ROURKE, USDA-ARS, Pullman, WA, USA

9:30 • In Vitro and in Vivo Models for the Biology, Pathogenesis, and Transmission of CWD–SUZETTE A. PRIOLA, Rocky Mountain Laboratories, Hamilton, MT, USA

10:00 • Break

10:30 • Epidemiology of CWD in Wildlife–ELIZABETH S. WILLIAMS, University of Wyoming, Laramie, WY, USA

11:00 • Control Measures for CWD–
To be determined

11:30 • Panel Discussion

S17 Applications of DNA Chip Technology in the Food Safety Area – Regency Ballroom A-B

Sponsored by IAFP Foundation Fund

Organizers/Convenors: Jeff Farber and Gisele LaPointe

8:30 • Overview of DNA Chip Tehcnology–NEIL WINEGARDEN, Ontario Cancer Institute, University Health Network, Toronto, Ontario, Canada

9:00 • Potential Application of DNA Chip Technology for the Molecular Typing of Microorganisms–BALA SWAMINATHAN, CDC, Atlanta, GA, USA

9:30 • An Industry Perspective on the Potential Application of DNA Chips to Food Safety–GIANFRANCO DE FEO, Affymetrix, Inc., Santa Clara, CA, USA

10:00 • Break

10:30 • Applications of DNA Chip Technology for the Study of the Virulence of Enteric Foodborne Pathogens–ANDREW BENSON, University of Nebraska, Lincoln, NE, USA

11:00 • Direct Applications of DNA Chips in Food Safety: *Campylobacter* spp.–JOHN NASH, National Research Council of Canada, Ottawa, Ontario, Canada

11:30 • Direct Applications of DNA Chips in Food Safety: *Listeria monocytogenes*–JEFF FARBER and FRANCO PAGOTTO, Health Canada, Ottawa, Ontario, Canada

S18 Sanitary Design of Plants and Equipment – Regency Ballroom C

Sponsored by IAFP Foundation Fund

Organizer: Vickie Lewandowski

Convenors: Tim Freier and Vickie Lewandowski

8:30 • Overview of Sanitary Design of Food Processing Facilities and Equipment–DONALD GRAHAM, Chesterfield, MO, USA

9:00 • The Relationship of Sanitary Design to Product Quality–JOE STOUT, Kraft, Northfield, IL, USA

9:30 • NSF Standard 14159 Hygenic Requirements for the Design of Meat and Poultry Processing Equipment–WILLIAM SCHWARTZ, NSF, Ann Arbor, MI, USA

10:00 • Break

10:30 • Recent Improvements to the Sanitary Design of Conveyors–TIM FREIER, Cargill, Wayzata, MN, USA

11:00 • Sanitary Design of Air Handling Systems–BRUCE PAULSON, Evapco, Owatonna, MN, USA

11:30 • European Perspective on Hygenic Plant and Equipment Design–JEFFREY BANKS, Qualicon, Wilmington, DE, USA

S19 Risk Assessment of Food Workers Hygiene Practices and Intervention Strategies – Cunningham Room

Sponsored by IAFP Foundation Fund

Organizer: Ewen Todd

Convenors: Jack Guzewich and Ewen Todd

8:30 • Hazard Identification in Ill and Asymptomatic Food Workers–BARRY MICHAELS, Georgia-Pacific Corporation, Palatka, FL, USA

9:00 • Exposure Assessment Based on an Investigation of Food Handling Transmission Routes–CHRIS GRIFFITH, University of Wales Institute, Cardiff, Wales, UK

9:30 • Transfer Rates of Viruses to Foods and Surfaces and Their Reduction through Proper Handwashing and Drying–SABAH BIDAWID, Health Canada, Ottawa, Ontario, Canada

10:00 • Break

10:30 • Modeling of Transfer of Pathogens in Handwashing–DON SCHAFFNER, Rutgers University, New Brunswick, NJ, USA

11:00 • Dose Response Modeling for Use in Food Worker Hygiene Risk Assessment–LEE-ANN JAYKUS, North Carolina State University, Raleigh, NC, USA

11:30 • Handwashing: What Works and What Doesn't – A Psychologist's Approach–DEBORAH CLAYTON, University of Wales Institute, Cardiff, Wales, UK

T05 General Food Microbiology – Regency Ballroom D-E

8:30 T43 • Food Safety and Security: Operational Risk Management Systems Approach–LARRY BARRETT, US Air Force and California Dept. of Health Services, Sacramento, CA, USA

8:45 T44 • The Food Safety Network: A Model for Scientific Risk Management and Public Engagement–BENJAMIN CHAPMAN and Douglas Powell, University of Guelph, Guelph, Ontario, Canada

9:00 T45 • Comparison of the Linear and Nonlinear Models of Thermal Inactivation of Milkborne Microorganisms–C. R. LOSS and J. H. Hotchkiss, Cornell University, Ithaca, NY, USA

9:15 T46 • A Quantitative Microbial Risk Assessment Model for Processed Postchill Broilers–IRA ZAKARIADZE and Yanbin Li, University of Arkansas, Fayetteville, AR, USA

9:30 T47 • Food Safety and Control Standards in Food Manufacturing Premises in Wales–GORDON HAYBURN, Chris Griffith, and Adrian Peters, University of Wales Institute-Cardiff, Cardiff, Wales, UK

9:45 T48 • The Perceived and Actual Cost of Quality Failures in the Welsh Food Manufacturing Sector and Links with Food Safety Management—DAVID LLOYD and Chris Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

10:00 • Break

10:30 T49 • Microbiological Levels in Warewash Machines Used in Foodservice Establishments—EVA STÅHL WERNERSSON, Håkan Håkanson, and Inger Lindvall, Granuldisk AB, Malmö, Sweden

10:45 T50 • Hygienic Practices Evaluation at Homes in Xalapa City, Veracruz, Mexico—PAOLA SABINA CONTRERAS ROMO, Laboratorio de Alta Tecnología de Xalapa, Xalapa, Veracruz, Mexico

11:00 T51 • Bacterial Populations Associated with Water in Vending Machines—JAYNE DRAKE, Adrian Peters, Louise Fielding, and Mike Saltmarsh, University of Wales Institute-Cardiff, Cardiff, Wales, UK

11:15 T52 • Food Safety Education Using a Cross-Disciplinary Approach and Web-based Teaching Materials—M. A. DAVIS, D. E. Conner, and W. F. Gale, Auburn University, Auburn, AL, USA

11:30 T53 • External Review of an Evidence-based Web site Containing Messages Related to Food and Water Safety for Consumers—BONNIE LACROIX and Douglas Powell, University of Guelph, Guelph, Ontario, Canada

11:45 T54 • Inactivation of Foodborne Viruses by High Pressure Processing—ALVIN LEE, Michelle Bull, Cindy Stewart, Lisa Szabo, Jason Wan, John Coventry, and Martin Cole, Food Science Australia, Werribee, Victoria, Australia

P04 Produce and Meat Microbiology

— Manchester Ballroom

9:00 a.m.—12:00 p.m.
(Authors present 9:30 a.m.—11:30 a.m.)

Convenors: Shiao Mei Lee and Wendy Wade

P142 • Improving the Safety of Harvest Practices for Strawberries for Processing—MARY PALUMBO, Nancy Nagle, Cindy Jewell, Michael Gutierrez, and Jeff Farrar, California Dept. of Health Services, Sacramento, CA, USA

P143 • Efficacy of an FDA Approved Peroxyacid-based Sanitizer to Inactivate *Escherichia coli* O157:H7 in Artificially Contaminated Alfalfa Seeds—PASCALE M. PIERRE, Elliot T. Ryser, and Jerry N. Cash, Michigan State University, East Lansing, MI, USA

P144 • Combination Treatments of Ozone, Chemical Preservatives, and Refrigerated Storage for Inactivation of *Escherichia coli* O157:H7 and *Salmonella* in Apple Cider—Charity A. Lakins, DAVID A. GOLDEN, and Susan S. Sumner, University of Tennessee, Knoxville, TN, USA

P145 • Irradiation Temperature Influences Product Quality Factors of Frozen Vegetables and Radiation Sensitivity of Inoculated *Listeria monocytogenes*—Brendan A. Niemira, Xuetong Fan, and CHRISTOPHER H. SOMMERS, USDA-ARS-ERRC, Wyndmoor, PA, USA

P146 • Effect of Citric Acid on the Radiation Resistance of *Listeria monocytogenes* and Frankfurter Quality Factors—CHRISTOPHER SOMMERS, Xuetong Fan, A. Philip Handel, and Kimberly Sokorai, USDA-ARS, Wyndmoor, PA, USA

P147 • Efficacy of Detergents to Enumerate Pathogenic Microorganisms from the Surface of Fresh Strawberries—RENEE M. RAIDEN, Susan S. Sumner, Merle D. Pierson, and Joseph D. Eifert, Virginia Tech, Blacksburg, VA, USA

P148 • Non-thermal Pathogen Reduction for *Escherichia coli* O157:H7 on Apple Surfaces Using Chlorine Dioxide Gas—J. DU, Y. Han, and R. H. Linton, Purdue University, W. Lafayette, IN, USA

P149 • Evaluation of Good Agricultural Practices and Good Manufacturing Practices in Export Growers and Packaging Houses of Fresh Fruits and Vegetables in Costa Rica—CARMELA VELÁZQUEZ and Fernando Aguilar, University of Costa Rica, San José, Costa Rica

P150 • Internalization of *Escherichia coli* in Apples—B. K. SEEMAN, S. S. Sumner, M. Pierson, R. Worobo, D. Kang, Virginia Tech., Blacksburg, VA, USA

P151 • Reduction of *Salmonella* spp. in Aqueous Treatments Used to Pack Fresh-Market Oranges—JENNIFER E. SNART, Mickey Parish, and Linda J. Harris, University of California-Davis, Davis, CA, USA

P152 • Inactivation of *Escherichia coli* O157:H7 and *Salmonella* in Apple Cider and Orange Juice by Combination Treatments of Ozone, Chemical Preservatives, and Refrigerated Storage—ROBERT C. WILLIAMS, David A. Golden, and Susan S. Sumner, Virginia Tech., Blacksburg, VA, USA

P153 • The Effect of Gamma Irradiation on *Escherichia coli* O157:H7 and *Salmonella* Inoculated on Strawberries—A. KILONZO, J. Kim, T. S. Huang, M. Carter, S. J. Weese, and C. I. Wei, Auburn University, Auburn, AL, USA

P154 • Differential Killing Activity of Cetylpyridinium Chloride (CPC), with or without Neutralizing Buffer Quench, against Firmly Adhered *Salmonella* Gaminara on Lettuce Stored at 4°C—MOEZNIMANWATY OSMAN, M. E. Janes, R. Story, R. Nannapaneni, and M. G. Johnson, University of Arkansas, Fayetteville, AR, USA

P155 • The Risk of Salmonellosis Associated with the Consumption of Raw Alfalfa Sprouts: An Exposure Assessment—LYNETTE KLEMAN and Lee-Ann Jaykus, North Carolina State University, Raleigh, NC, USA

P156 • Ultrasonic Treatment of a Rinse Solution to Enhance Enumeration of *Salmonella* spp. from Produce Surfaces—GABRIEL SANGLAY, Joseph Eifert, Merle Pierson, and Susan Sumner, Virginia Tech, Blacksburg, VA, USA

P157 • Microbial Profile of Conventionally and Organically Grown Spring Mix—Christie A. Phillips and MARK A. HARRISON, University of Georgia, Athens, GA, USA

P158 • The Analysis of Pathogens in Chicken Manure Fertilizer—TRISTIN CRENSHAW, Christopher Choi, and Charles Gerba, University of Arizona, Tucson, AZ, USA

P159 • Comparison of Dipping, Spotting, and Spraying Methods to Inoculate *Listeria monocytogenes* on Green Pepper Surfaces—Y. HAN and R. H. Linton, Purdue University, W. Lafayette, IN, USA

P160 • Physical Means of Inactivating *Salmonella, Escherichia coli* O157:H7, and *Listeria monocytogenes* on Alfalfa Seeds—Chih-Ying Lu, Stuart O. Nelson, Larry R. Beuchat, and MARK A. HARRISON, University of Georgia, Athens, GA, USA

P161 • Fate of *Salmonella* in Homemade Unpasteurized Fruit and Vegetable Juices—Claudia M. Cornwell and MARK A. HARRISON, University of Georgia, Athens, GA, USA

P162 • Withdrawn

P163 • Reduction of Microbes Attached to Fresh-cut Lettuce Using Electrochemically Activated Water Spray—BETTY L. SWEM, Hong Yang, Yulai Cheng, and Yanbin Li, University of Arkansas-Fayetteville, Fayetteville, AR, USA

P164 • Survival of *Shigella flexneri* on Strawberries Stored at -20, 4, and 24°C—STEPHAN FLESSA and Linda J. Harris, University of California-Davis, Davis, CA, USA

P165 • Growth of *Salmonella* Enteritidis PT 30 on Almond Hulls and Shells—LINDA J. HARRIS, Solymar Ontiveros, and Aaron Uesugi, University of California-Davis, Davis, CA, USA

P166 • Contamination of Vegetable Crops Irrigated with Dairy Wastewater—FAEZAH MANSHADI, Pablo Gortares, Martin M. Karpiscak, Robert J. Freitas and Charles P. Gerba, University of Arizona, Tucson, AZ, USA

P167 • Survival of Acid-adapted or Nonadapted *Escherichia coli* O157:H7 in Apple Wounds following Chemical Treatments and Storage of Samples—J. Ikeda, J. D. STOPFORTH, P. A. Kendall, and J. N. Sofos, Colorado State University, Ft. Collins, CO, USA

P168 • Efficacy of Calcinated Calcium in Killing *Escherichia coli* O157:H7, *Salmonella* and *Listeria monocytogenes* on the Surface of Tomatoes—M. L. BARI, Y. Inatsu, S. Kawasaki, E. Nazuka, and K. Isshiki, National Food Research Institute, Tsukuba, Japan

P169 • Survival of *Listeria monocytogenes* in a Simulated Recirculating Brine Chiller System—J. K. GAILEY, J. S. Dickson, and W. Dorsa, Iowa State University, Ames, IA, USA

P170 • Investigation for Potential Sites of Microbial Contamination of Sliced Ready-to-eat Meat Products—L. PEDROSO, A. Louçã and J. Sofos, Instituto Superior de Ciências da Saúde - Sul, Caparica, Portugal

P171 • Ability of *Listeria monocytogenes* to Withstand Re-heating of Frankfurters—Anna C. S. Porto, Manuela Osoria, Peggy Williamson, Caitriona Byrne, Lisa Yoder, JEFFREY E. CALL, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P172 • Use of PFGE to Determine the Persistence of a Five-strain Mixture of *Listeria monocytogenes* during Chilled Storage of Vacuum-sealed Packages of Frankfurters—Anna Porto, LAURA WONDERLING, Jeffrey Call, and John B. Luchansky, USDA-ARS-ERRC, Wyndmoor, PA, USA

P173 • Evaluation of *Listeria monocytogenes* Survival in Inoculated Frankfurters Following Consumer Accessible Cooking Instructions—M. T. ORTEGA-VALENZUELA, R. K. Phebus, and H. Thippareddi, Kansas State University, Manhattan, KS, USA

P174 • Edible Zein Film Coatings Containing Nisin and EDTA to Control *Listeria monocytogenes* Inoculated onto the Surfaces of Turkey Franks—M. E. JANES, B. Lungu, and M. G. Johnson, University of Arkansas, Fayetteville, AR, USA

P175 • Inactivation of *Listeria monocytogenes* on Ready-to-eat Hot Dogs Treated with Volatilized Acetic Acid—Nancy Jensen, Andrew Inglis, and PETER W. BODNARUK, Food Science Australia, North Ryde, NSW, Australia

P176 • Effects of Pediocin and Post-packaging Thermal Pasteurization on *Listeria monocytogenes* on Frankfurters—CHIH-MING CHEN, Joseph G. Sebranek, James S. Dickson, and Aubrey F. Mendonca, Iowa State University, Ames, IA, USA

P177 • Effects of Pediocin and Post-packaging Irradiation on *Listeria monocytogenes* on Frankfurters—CHIH-MING CHEN, Joseph G. Sebranek, James S. Dickson, and Aubrey F. Mendonca, Iowa State University, Ames, IA, USA

P178 • Hydrostatic Pressurization at 50°C in the Presence of Bacteriocin Completely Eliminated Contaminated *Listeria monocytogenes* in Processed Meat Products—SOMNATH BANDYOPADHYAY, Alex Wolf, Norsak Kalchayanand, and Bibek Ray, University of Wyoming, Laramie, WY, USA

P179 • Effect of Packaging Materials on Inactivation of Pathogenic Microorganisms on Meat during Irradiation—Kathiravan Krishnamurthy, ALI DEMIRCI, Virendra M. Puri, and Catherine N. Cutter, Pennsylvania State University, University Park, PA, USA

(Wednesday a.m., *continued*)

P180 • Effect of Acid Adaptation on Destruction of *Salmonella* during Drying (60°C) and Storage (25°C) of Beef Jerky Treated with Marinades–Mehmet Calicioglu, JOHN N. SOFOS, John N. Samelis, and Patricia A. Kendall, Colorado State University, Ft. Collins, CO, USA

P181 • Influence of Marinades on Survival during Storage at 25°C of Acid-adapted and Nonadapted *Listeria monocytogenes* or *Salmonella* Inoculated Post-drying on Beef Jerky–Mehmet Calicioglu, JOHN N. SOFOS, and Patricia A. Kendall, Colorado State University, Ft. Collins, CO, USA

P182 • Distribution of *Escherichia coli* O157:H7 in Ground Meat Resulting from a Laboratory-scale Grinder–ROLANDO A. FLORES, Tod Stewart, and Mark Tamplin, USDA-ERRC-ARS, Wyndmoor, PA, USA

P183 • Origin of Ground Beef Contamination and Genetic Diversity of *Escherichia coli* in Beef Production Processes–MUEEN ASLAM, Frances Nattress, Gordon Greer, Colin Gill, and Lynn McMullen, Agriculture and Agri-Food Canada, Lacombe, Alberta, Canada

P184 • The Growth of *Escherichia coli* O157:H7 in Retail and Irradiated Ground Beef at 10°C–MARK L. TAMPLIN, USDA-ARS-ERRC, Wyndmoor, PA, USA

P185 • Influence of Composition and Packaging of Beef Patties on Gamma Radiation Inactivation of *Escherichia coli* O157:H7–Dory Worcman-Barninka, Bernadette D. G. M. Franco, Maria Teresa Destro, and MARIZA LANDGRAF, University of São Pãulo-Brazil, São Pãulo, Brazil

P186 • PCR Characterization of Enterohemorrhagic *Escherichia coli* from Fecal, Hide and Ground Beef Samples–ADAM B. OLSON, Frances Nattress, Gordon Greer, Mueen Aslam, and Lynn M. McMullen, University of Alberta, Edmonton, Alberta, Canada

P187 • The Effect of a Mixture of Lactic Acid and Nisin on the Shelf Life of Retail and Vacuum Packaged Fresh Meat–ENRIQUE MARQUEZ SALAS, Kenna Ferrer, Yasmina Barboza de Martinez, and Jorge Ruíz Ramires, Universidad del Zulia, Maracaibo, Zulia, Venezuela

WEDNESDAY AFTERNOON – JULY 3, 2002

1:30 p.m. – 5:00 p.m.

S20 **Customized Approaches to Microbiological Risk Assessment** – Manchester Ballroom A-B

Organizer: Leon Gorris

Convenors: Leon Gorris and Tom Ross

1:30 • Approaches to and Outcomes of Formal Microbiological Risk Assessments–JORGEN SCHLUNDT, World Health Organization, Geneva, Switzerland

2:00 • Ranking of Microbiological Risks–RICHARD WHITING, FDA-CFSAN, College Park, MD, USA

2:30 • Microbiological Risk Profiling–SERVE NOTERMANS, TNO Nutrition and Food Research Institute, 3700 AJ Zeist, The Netherlands

3:00 • Break

3:30 • A Simple Decision Support Tool for MRA–TOM ROSS, University of Tasmania, Hobart, Tasmania, Australia

4:00 • Tiered Approaches to MRA Covering Part of the Supply Chain–LEON GORRIS, Unilever, SEAC – Risk Analysis Group, Sharnbrook, UK

4:30 • Process Risk Assessment–AAMIR M. FAZIL, Health Canada, Guelph, Ontario, Canada

S21 **Control of *Escherichia coli* O157:H7 in Cattle** – Regency Ballroom A-B

Sponsored by IAFP Foundation Fund and Warren Analytical Laboratory

Organizer: Francisco Diez-Gonzalez

Convenors: Mindy Brashears and Francisco Diez-Gonzalez

1:30 • Effect of Dietary Changes and Forage Feeding–FRANCISCO DIEZ-GONZALEZ, University of Minnesota, St. Paul, MN, USA

2:00 • Control of *E. coli* O157 in Livestock Drinking Water–JEFFREY T. LEJEUNE, Ohio State University, Wooster, OH, USA

2:30 • Use of Chlorate Salt Preparations as Feed Additives for Preharvest Control of Enterohemorrhagic *E. coli* and *Salmonella*–ROBIN ANDERSON, Southern Plains Agricultural Research Center, College Station, TX, USA

3:00 • Break

3:30 • Competitive Exclusion of *E. coli* in Beef Cattle–MINDY BRASHEARS, Texas Tech University, Lubbock, TX, USA

4:00 • Vaccination as a Tool to Reduce Colonization of Cattle by *E. coli* O157–ANDREW A. POTTER, Veterinary Infectious Disease Organization, Saskatoon, Saskatchewan, Canada

4:30 • Use of Dietary Supplements to Manage Generic and Toxigenic *E. coli* in Tropical Beef Production Systems–DENIS O. KRAUSE, CSIRO Livestock Industries, Indooroopilly, Australia

S22 **Current Practices in Produce Safety** – Regency Ballroom C

Sponsored by Dole Food Company

Organizer: Donna Garren

Convenors: Philip G. Blagoyevich and Donna Garren

1:30 • Good Agricultural and Manufacturing Practices in the Fresh Produce Industry: An Overview–BOB GRAVANI, Cornell University, Ithaca, NY, USA

2:00 • Industry Perspective on the Development, Implementation, and Verification of GAPs and GMPs—MAHIPAL KUNDURU, Dole Fresh Vegetables, Inc., Salinas, CA, USA

2:30 • Impact of Growing and Post-harvest Practices on Produce Food Safety: An Overview—TREVOR SUSLOW, University of California-Davis, Davis, CA, USA

3:00 • Break

3:30 • Safe Growing and Handling Practices to Reduce Chemical Hazards—JOE FURUIKE, Driscoll Strawberry Associates, Inc., Watsonville, CA, USA

4:00 • Safe Growing and Handling Practices to Reduce Microbial and Physcial Hazards—FRANCES PABRUA, Fresh Advantage, Salinas, CA, USA

4:30 • Panel Discussion

S23 Food Safety Education Update – Cunningham Room

Organizers/Convenors: Robert B. Gravani and O. Peter Snyder Jr.

1:30 • Effective Consumer Food Safety Education—CHRISTINE BRUHN, University of California-Davis, Davis, CA, USA

2:00 • Food Safety Education for Chefs—O. PETER SNYDER, JR., Hospitality Instutite of Technology and Management, St. Paul, MN, USA

2:30 • Communicating Food Safety and Security in a Manufacturing Environment: A Case History—PETE FRIEDMAN, ACH Food Companies, Cordova, TN, USA

3:00 • Break

3:30 • Educating Retail Food Handlers—ROBERT B. GRAVANI, Cornell University, Ithaca, NY, USA

4:00 • Elementary School and Preschool Education Efforts—JUDY HARRISON, University of Georgia, Athens, GA, USA

4:30 • Reinforcing Safe Food Handling Practices of Junior and Senior High Schoolers—LAURA FOX, FDA, Arlington, VA, USA

T06 Antimicrobials – Regency Ballroom D-E

1:30 T55 • Extension of Produce Shelf Life following Acidified Sodium Chlorite Treatment during Processing—G. KERE KEMP, C. Cayce Warf, Chris Hawk, and Scott Musgrave, Alcide Corporation, Redmond, WA, USA

1:45 T56 • Application of Natural Antimicrobial Systems to RTE Food for Control of *Clostridium botulinum*—XINTIAN MING, Jeff Lambeseder, Jan Payne, and Bill King, Rhodia Foods, Madison, WI, USA

2:00 T57 • Assessment of the Antibacterial Properties of Ozone on Aerosolized *Micrococcus luteus* Using a Bioaerosol Test Chamber—R. A. BAILEY, A. Young, L. Fielding, and C. Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

2:15 T58 • Evaluation of a Foaming High Retention Peracetic Acid System—CRYSTAL A. NESBITT, Kenneth E. Kellar, Joseph C. Richards, and Mark A. Weiss, FMC Corporation, Princeton, NJ, USA

2:30 T59 • Decontamination in the Food Industry Using Ozone—L. M. FIELDING, L. Creed, R. A. Bailey, C. G. Griffith and A. C. Peters, University of Wales Institute-Cardiff, Cardiff, Wales, UK

2:45 T60 • Efficacy of an Acidified Sodium Chlorite In-home Antimicrobial Spray on Produce—G. KERE KEMP and Keith Schneider, Alcide Corporation, Redmond, WA, USA

3:00 • Break

3:30 T61 • Comparison of Intervention Technologies for Reducing *Escherichia coli* O157:H7 on Beef Cuts and Trimmings—J. R. RANSOM, K. E. Belk, J. N. Sofos, J. A. Scanga, and G. C. Smith, Colorado State University, Ft. Collins, CO, USA

3:45 T62 • Effects of Dried Plum Purées on Suppression of Growth of Foodborne Pathogens in Uncooked Pork Sausage—LESLIE K. THOMPSON and Daniel Y. C. Fung, Kansas State University, Manhattan, KS, USA

4:00 T63 • Sources of *Listeria monocytogenes* Contamination in a Salmon Smokehouse and Comparison of Two Sanitizing Procedures—BIRTE FONNESBECH VOGEL, Dorthe Bagge, Kelna Gardshodn, and Lone Gram, Danish Institute for Fisheries Research, Lyngby, Denmark

4:15 T64 • The Evaluation and Control of Biofilm of Signficance to the Food Industry—ADRIAN PETERS, Karen Elvers, and Chris Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

4:30 T65 • Comparison of Multiple Antimicrobial Resistance among *Salmonella* Isolates of Animal Origin—P. J. FEDORKA-CRAY, M. L. Headrick, B. Salamone, N. Anandaraman, B. Rose, J. T. Gray, and D. A. Dargatz, USDA-ARS, Athens, GA, USA

4:45 T66 • Characterization of Multiple Fluoroquinolone Resistance among Avian *Escherichia coli* Isolates from North Georgia—JUAN F. DE VILLENA, David D. White, Shaohua Zhao, John J. Maurer, and Jianghong Meng, University of Maryland-College Park, College Park, MD, USA

P05 Poultry, Meat and General Food Microbiology – Manchester Ballroom

2:00 p.m.–5:00 p.m.
(Authors present 2:30 p.m.–4:30 p.m.)

Convenors: Angela Hartman and Gabe Sanglay

P188 • Outbreak Alert—CAROLINE SMITH DEWAAL, Center for Science in the Public Interest, Washington, D.C., USA

P189 • Investigation of *Clostridium botulinum* (Botulism) Outbreak in Texas, 2001—STEVEN D. BENGTSON, Denise R. Lewis, Kristin G. Holt, and D. W. Chen, USDA-FSIS-OPHS-HHSD, Washington, D.C., USA

(Wednesday p.m., *continued*)

P190 • Microbiology of Flour Milling—AILSA D. HOCKING, Lana K. Berghofer, and Di Miskelly, Food Science Australia, North Ryde, NSW, Australia

P191 • Commodity-specific Food Safety Training Program Partnerships—INGEBORG SMALL, Michelle Smith, Sandra Bahn, and Jeff Farrar, California Dept. of Health Services, Sacramento, CA, USA

P192 • Commercial Food Handlers' Knowledge, Attitudes and Implementation of Food Hygiene Practices—D. A. CLAYTON and C. J. Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P193 • Operational Risk Management—Food Safety and Security Training—INGEBORG SMALL, Jennifer Thomas, Sandra Bahn, and Jeff Farrar, California Dept. of Health Services, Sacramento, CA, USA

P194 • A Meta-Analysis of International Consumer Food Safety Studies—E. C. REDMOND and C. J. Griffith, University of Wales Institute-Cardiff, Cardiff, Wales, UK

P195 • Efficacy of Alcohol Gel Instant Hand Sanitizer When Used in Conjunction with Normal Handwashing—BARRY MICHAELS, Maria Arenas, Ann Schultz, and Vidhya Gangar, Georgia-Pacific Corporation, Palatka, FL, USA

P196 • Characterization of the Acid Tolerance Response in *Salmonella* Species Induced by Acid Shock and Moderate pH—Malika Meemongkolkiat, David Benson, and CLAUDIA KOERTING, University of Connecticut, Storrs, CT, USA

P197 • Determining the Feasibility of Developing a Food Safety Virtual Reference Service on the World Wide Web—DANIEL HENROID, JR. and James Huss, Iowa State University, Ames, IA, USA

P198 • Migration and Growth of *Salmonella* Enteritidis in Chicken Eggs as Influenced by Storage Time and Temperature and by Breakdown of Yolk Membrane—NUTAN MYTLE and Jinru Chen, CFS, University of Georgia, Griffin, GA, USA

P199 • Thermal Inactivation of *Salmonella* Senftenberg and *Listeria innocua* in Battered and Breaded Meat Product during Frying and Convection Cooking—RONG Y. MURPHY and E. R. Johnson, University of Arkansas, Fayetteville, AK, USA

P200 • Thermal Inactivation of *Salmonella* Senftenberg and *Listeria innocua* in Undercooked Meat Product during Impingement Cooking—RONG Y. MURPHY and E. R. Johnson, University of Arkansas, Fayetteville, AK, USA

P201 • Comparison of the Pulsed Field Gel Electrophoresis (PFGE) Patterns for *Salmonella* Enteritidis Isolates from Human Origin in Taiwan and Those from Poultry Origin in USA—HAU-YANG TSEN and Jer-Sheng Lin, National Chung-Hsing University, Taichung, Taiwan, R.O.C.

P202 • Survival of *Campylobacter jejuni* on Sterile Chicken Breast Burgers Stored at Refrigeration and Ambient Temperatures—KISUN YOON, Candace N. Burnette, and Thomas P. Oscar, University of Maryland Eastern Shore, Princess Anne, MD, USA

P203 • Reduction of *Salmonella* Typhimurium in Experimentally Challenged Broilers by Nitrate Adaptation and Chlorate Supplementation in Drinking Water—YONG SOO JUNG, Robin C. Anderson, James A. Byrd, Randle W. Moore, Todd R. Callaway, Thomas S. Edrington, and David J. Nisbet, USDA-ARS, College Station, TX, USA

P204 • Water as a Possible Vehicle of Infection for *Campylobacter* in Broilers—I. D. OGDEN, M. MacRae, M. Johnston, and D. Newell, University of Aberdeen, Foresterhill, Aberdeen, UK

P205 • Microbiological Assessment of Raw and Ready-to-eat Meat and Poultry Products Collected from the Retail Marketplace in Edmonton, Alberta, Canada—LYNN M. MCMULLEN, Michael E. Stiles, Valerie Bohaychuk, Gary Gensler, Robin King, Ole Sorensen, John Wu, and Ken Manninen, University of Alberta, Edmonton, Alberta, Canada

P206 • Antibiotic Resistant *Salmonella* spp., *Listeria monocytogenes*, *Staphylococcus aureus*, and *Campylobacter jejuni* Isolated from Poultry Processing in Korea—WONKI BAE, Nam-Hoon Kwon, Ji-Yeun Lim, Jun-Man Kim, Kyoung-Min Roh, Jin Hur, Ji-Yeon Kim, So-Hyun Kim, and Yong-Ho Park, Seoul National University, Suwon, Gyounggyi, Korea

P207 • *Campylobacter* and *Salmonella* Levels in US Poultry – Some Conclusions from Baseline Data Collected 1994-95 and 1999-2000—DENISE R. EBLEN and L. Victor Cook, USDA-FSIS-OPHS, Washington, D.C., USA

P208 • Reduction of *Campylobacter jejuni* on Poultry by Low-temperature Treatment—TONG ZHAO, Gabriel O. I. Ezeike, Michael P. Doyle, Yen-Con Hung, Rhonda S. Howell, and Jim Ayres, University of Georgia, Center for Food Safety, Griffin, GA, USA

P209 • *Campylobacter* MPN Enumeration in Chicken Carcasses—G. PEZZOTTI, A. Serafin, A. Buratin, and C. Bacelle, Istituto Zooprofilattico Sperimentale delle Venezie, Legnaro, Padova, Italy

P210 • Growth and Survival of *Salmonella* Typhimurium and *Campylobacter jejuni* on Sterile Ground Chicken Patties under Aerobic Conditions at Various Temperatures—CANDACE N. BURNETTE and Ki S. Yoon, University of Maryland Eastern Shore, Princess Anne, MD, USA

P211 • Variation in Genetic Clonality among Multi-drug Resistant *Salmonella enterica* Isolated from a Turkey Production Facility—RAJESH NAYAK, Rong-Fu Wang, and Carl E. Cerniglia, FDA, Jefferson, AR, USA

P212 • Molecular Typing of Guillian-Barré Syndrome Initiating Antibiotic-resistant *Campylobacter* Strains Isolated from Turkey Litter—R. Nayak, M. S. NAWAZ, R. F. Wang, S. A. Khan, and A. A. Khan, FDA, Jefferson, AR, USA

P213 • Quantitative Monitoring of Ciprofloxacin-Resistant and -Sensitive *Campylobacter* Populations on Pre- and Post-chilled Raw Broiler Carcasses from Poultry Processing—R. Nannapaneni, R. Story, K. Wiggins, and M. G. JOHNSON, University of Arkansas, Fayetteville, AR, USA

P214 • Antibiotic Resistance in Guatemalan Cattle—ERIC RUNDLETT, Eric Davis, and Ann Draughon, University of Tennessee Food Safety Center of Excellence, Knoxville, TN, USA

P215 • Treatment of Wastewater in a Laboratory-scale Fluidized Bed Bioreactor—D. Lindsay, U. Meeta, S. Moodley, V. Gray, and A. VON HOLY, University of the Witwatersrand, Johannesburg, South Africa

P216 • A Predictive Model to Determine the Effects of Temperature, Sodium Pyrophosphate, and Sodium Chloride on Thermal Inactivation of Starved *Listeria monocytogenes* in Pork Slurry—MAKUBA LIHONO, Aubrey Mendonca, and James Dickson, Iowa State University, Ames, IA, USA

P217 • Influence of Fingernail Length and Type on Removing *Escherichia coli* from the Nail Regions Using Different Hand Washing Interventions—C.-M. LIN, F.-M. Wu, M. P. Doyle, B. S. Michaels, and K. Williams, University of Georgia, CFSQE, Griffin, GA, USA

P218 • Biocontrol of Zearalenone, an Estrogenic Mycotoxin: Interaction with Food Grade *Lactobacilli*—HANI EL-NEZAMI, Nektaria Polychronaki, Seppo Salminen, and Hannu Mykkanen, University of Kuopio, Kuopio, Finland

P219 • The Influence of Food Microtopography on the Distribution of Bacteria in Two Food Spoilage Associations—GARY A. DYKES and Alexander von Holy, Saskatchewan Food Product Innovation Program, Dept. of Applied Microbiology and Food Science, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

P220 • Ultraviolet Inactivation of Caliciviruses: First Study—SUPHACHAI NUANUALSUWAN, Sakchai Himathongkham, Hans Riemann, MingQi Deng, and Dean Cliver, University of California-Davis, Davis, CA, USA

P221 • Increased Thermotolerance of *Clostridium perfringens* Spores following Sublethal Heat Shock—VIJAY K. JUNEJA and John S. Novak, USDA-ARS-ERRC, Wyndmoor, PA, USA

P222 • Screening of Lactic Acid Bacteria Strains as Potential Probiotics—CHENG-CHIH TSAI, Li-Fang Huang, Chia-Chan Lin, Wen-Hsin Lin, and Hau-Yan Tsen, National Chung Hsing University, Taichung, Taiwan, ROC

P223 • Growth Kinetics of Parent and Green Fluorescent Protein-producing Strains of *Salmonella*—T. P. OSCAR, USDA-ARS, University of Maryland Eastern Shore, Princess Anne, MD, USA

P224 • High Hydrostatic Pressure Inactivation of Calicivirus (SMSV-17) in Oysters—K. R. CALCI, W. Burkhardt III, and A. W. Smith, FDA, Dauphin Island, AL, USA

P225 • Comparison of Sample Preparation Methods for Recovering *Salmonella* Enteritidis in Eggs—K. H. SEO, R. E. Brackett, I. E. Valentin-Von, and P. S. Holt, FDA/CFSAN, Washington, D.C., USA

Visit our Web site
www.foodprotection.org

89th Annual Meeting

June 30–July 3, 2002

Event Information

EVENING EVENTS

Cheese and Wine Reception

Sunday, June 30, 2002 • 8:00 p.m. – 10:00 p.m.

Attendees and guests are invited to this traditional reception in the exhibit hall.

Exhibit Hall Reception

Monday, July 1, 2002 • 5:00 p.m. – 6:30 p.m.

Network with fellow food safety professionals during this informal reception while seeing the latest developments in the industry.

Monday Night Social at the San Diego Zoo

Monday, July 1, 2002 • 6:00 p.m. – 10:00 p.m.

Polar Bear Plunge, Tiger River, Gorilla Tropics and Ituri Forest – sound interesting? The World-Famous San Diego Zoo has been the gem of the city of San Diego for more than 80 years. Join us for the Monday Night Social and see first hand some of the world's rarest wildlife. Dinner will be provided in a reserved area for IAFP 2002 attendees. The Zoo will remain open to you and the public until 10:00 p.m. Explore the Zoo on a three-mile guided double-deck bus tour or go on your own adventure. Price includes admission to the Zoo, dinner, and transportation. Get your ticket today!

San Diego Dinner Cruise

Tuesday, July 2, 2002 • 6:00 p.m. – 10:30 p.m.

The celebration begins the moment you board the Hornblower Yacht. Watch the sun go down, sip champagne and enjoy a three-course dinner prepared fresh on board by talented chefs. Then dance to music or watch the San Diego sights drift by from the outdoor decks. Tickets are limited so get yours today.

Awards Banquet

Wednesday, July 3, 2002 • 7:00 p.m. – 9:30 p.m.

A special occasion to formally recognize the accomplishments of deserving food safety professionals. An elegant reception and dinner are followed by the awards ceremony. Business attire requested.

IAFP FUNCTIONS

New Member Reception

Saturday, June 29, 2002 • 4:30 p.m. – 5:30 p.m.

If you recently joined the Association or if this is your first time attending an IAFP Annual Meeting, welcome! Attend this informal reception to learn how to get the most out of attending the Meeting and meet some of today's leaders.

Affiliate Reception

Saturday, June 29, 2002 • 5:30 p.m. – 7:00 p.m.

Affiliate officers and delegates plan to arrive in time to participate in this educational reception. Watch your mail for additional details.

Committee Meetings

Sunday, June 30, 2002 • 7:00 a.m. – 5:00 p.m.

Committees and professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on any number of committees or PDGs.

Student Luncheon

Sunday, June 30, 2002 • 12:00 p.m. – 1:30 p.m.

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP. Sign up for the luncheon to help start building your professional network.

IAFP Job Fair

Sunday, June 30, 2002 thru Wednesday July 3, 2002

Employers, take advantage of recruiting the top food scientists in the world! Post your job announcements and interview candidates. Watch for additional information at www.foodprotection.org.

DAYTIME TOURS

(Lunch included in all daytime tours)

Wine Country Tour

Saturday, June 29, 2002 • 10:00 a.m. – 3:00 p.m.

The Temecula Valley Wine Country tour takes you on a visit to the Callaway and Thornton (formerly Culbertson's) Wineries. Guests will enjoy a private in-depth tour and a lecture-tasting of white wine at Callaway.

Afterwards, we will cross the road to Thornton for a short tour on the art of making fine champagnes. Thornton still employs the French method of hand turning the bottles during the fermenting process.

A box lunch will be served. You will be sure to enjoy this Southern California wine tasting experience!

Scenic San Diego by Land and Sea

Sunday, June 30, 2002 • 10:00 a.m. – 3:00 p.m.

Visit San Diego, the city that glistens by the sea!

The highlights of "America's Finest City" will be presented on this narrated guided tour. You will see areas such as: Old Town, Balboa Park, and San Diego's Downtown areas including the Gaslamp District and Horton Plaza. We will then tour and enjoy lunch in one of California's most charming coastal resort towns, Coronado Island.

After seeing the city by land, you will board a yacht to cruise the calm waters of the San Diego Bay. Guides will narrate points of interest such as the Coronado Bay Bridge, the Navy shipyards and aircraft carriers, Shelter Island, Harbor Island and North Island. You will enjoy this relaxing day of learning about the city that glistens by the sea!

La Jolla: The Jewel of San Diego

Monday, July 1, 2002 • 10:00 a.m. – 3:00 p.m.

La Jolla, with the tantalizing charm of a Mediterranean Isle, unique shops and breathtaking views of the Pacific, is a refreshing change of pace sure to delight even the most discriminating visitor! You will see the La Jolla Bay and Cove area. The famed La Jolla Underwater Park, maintained as an ecological reserve, is a favorite spot for scuba divers and snorkelers.

Tour guests will delight in a special 45-minute historical walking tour of La Jolla. This tour will bring the history of La Jolla to life with a personal docent who is a resident expert.

Shopping is always an extraordinary experience in La Jolla. Among the many boutiques, import shops, galleries and specialty food shops, you are sure to find unique and exclusive gifts.

A delicious lunch at George's at the Cove, one of the many fine restaurants in La Jolla, will be a special treat for all.

Behind the Scenes at the Wild Animal Park

Tuesday, July 2, 2002 • 9:00 a.m. – 2:00 p.m.

The San Diego Wild Animal Park began more than 20 years ago as a breeding facility for the San Diego Zoo's large animals. Dr. Charles Schroeder had the vision to open the 2,100-acre wildlife sanctuary for visitors to view animals roaming freely in settings similar to their native homelands. Known worldwide for its conservation efforts, the Wild Animal Park boasts over 3,000 animals from over 250 species and over 3,000 different exotic plant species.

You will enjoy a "Beastly Business" tour at the Wild Animal Park. This tour offers participants a private guided program focusing on the mammal, bird, and plant collection at the Wild Animal Park. Guests will enjoy a private monorail tour to view the extensive Asian and African field enclosures where rhinos, antelopes, giraffes, monkeys, elephants, and flamingo can be spotted from the train.

The entire program is conducted by a personal guide who can share the latest updates on animal births, new exhibit plans, and ways to help conserve endangered animals and their habitat.

As part of the "Behind the Scenes Tour," you will also experience a privately guided walking tour and an up close encounter with an exotic animal and its trainer in a special VIP Program. A lunch voucher is included so you can grab a bite to eat while enjoying your day at the Wild Animal Park.

HOSPITALITY ROOMS

Spouse/Companion Room

Register your spouse/companion and they will have access to the hospitality room where a continental breakfast and afternoon snacks are provided Sunday through Wednesday.

Retired Member Room

At the request of IAFP Retired Members, a room has been set aside for their use. A cribbage board, cards, and other games will be available. You are invited to bring your favorite game to challenge your fellow retired colleagues.

89th Annual Meeting

June 30–July 3, 2002

IMPORTANT! Please read this information before completing your registration form.

MEETING INFORMATION

Register to attend the world's leading food safety conference.

Registration includes:

- Technical Sessions
- Symposia
- Poster Presentations
- Ivan Parkin Lecture
- Exhibit Hall Admittance
- Cheese and Wine Reception
- Exhibit Hall Reception
- Program and Abstract Book

4 EASY WAYS TO REGISTER

Complete the Attendee Registration Form and submit it to the International Association for Food Protection by:

Online: www.foodprotection.org

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W,
Des Moines, IA 50322-2864, USA

Phone: 800.369.6337; 515.276.3344

The early registration deadline is May 30, 2002.
After this date, late registration fees are in effect.

REFUND/CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by June 7, 2002. No refunds will be made after June 7, 2002; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 8, 2002. Event and tour tickets purchased are nonrefundable.

EXHIBIT HOURS

Sunday, June 30, 2002	8:00 p.m. – 10:00 p.m.
Monday, July 1, 2002	9:30 a.m. – 1:30 p.m. 3:00 p.m. – 6:30 p.m.
Tuesday, July 2, 2002	9:30 a.m. – 1:30 p.m.

DAYTIME TOURS

(Lunch included in all daytime tours)

Saturday, June 29, 2002	
Wine Country Tour	10:00 a.m. – 3:00 p.m.
Sunday, June 30, 2002	
Scenic San Diego by Land and Sea	10:00 a.m. – 3:00 p.m.
Monday, July 1, 2002	
La Jolla: The Jewel of San Diego	10:00 a.m. – 3:00 p.m.
Tuesday, July 2, 2002	
Behind the Scenes at the Wild Animal Park	9:00 a.m. – 2:00 p.m.

EVENING EVENTS

Sunday, June 30, 2002	
Opening Session	7:00 p.m. – 8:00 p.m.
Cheese and Wine Reception	8:00 p.m. – 10:00 p.m.
Monday, July 1, 2002	
Exhibit Hall Reception	5:00 p.m. – 6:30 p.m.
Monday Night Social at the San Diego Zoo	6:00 p.m. – 10:00 p.m.
Tuesday, July 2, 2002	
Dinner Cruise	6:00 p.m. – 10:30 p.m.
Wednesday, July 3, 2002	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

HOTEL INFORMATION

For reservations, contact the hotel directly and identify yourself as an International Association for Food Protection Annual Meeting attendee to receive a special rate of $143 per night, single or double. Make your reservations as soon as possible; this special rate is available only until May 30, 2002.

Manchester Grand Hyatt San Diego
(Formerly Hyatt Regency San Diego)
One Market Place
San Diego, California 92101
Phone: 800.233.1234
619.232.1234

International Association for
Food Protection®
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: 800.369.6337 • 515.276.3344
Fax: 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

Attendee Registration Form

June 30–July 3, 2002
San Diego, CA

Name (Print or type your name as you wish it to appear on name badge) _____ Member Number: _____

Employer _____ Title _____

Mailing Address (Please specify: ❒ Home ❒ Work) _____

City _____ State/Province _____ Country _____ Postal/Zip Code _____

Telephone _____ Fax _____ E-mail _____

❒ First time attending meeting Member since: _____

❒ Regarding the ADA, please attach a brief description of special requirements you may have.

❒ IAFP occasionally provides Attendees' addresses (excluding phone and E-mail) to vendors and exhibitors supplying products and services for the food safety industry. If you prefer NOT to be included in these lists, please check the box.

REGISTRATION FEES:	MEMBERS	NONMEMBERS	TOTAL
Registration (Awards Banquet included)	$ 345	$ 495	_____
Association Student Member (Awards Banquet included)	$ 60	Not Available	_____
Retired Association Member (Awards Banquet included)	$ 60	Not Available	_____
One Day Registration:* ❒ Mon. ❒ Tues. ❒ Wed.	$ 190	$ 250	_____
Spouse/Companion* (Name): _____	$ 45	$ 45	_____
Children 15 & Over* (Names): _____	$ 25	$ 25	_____
Children 14 & Under* (Names): _____	FREE	FREE	_____
*Awards Banquet not included			
EVENTS:		**# OF TICKETS**	
Student Luncheon (Sunday, 6/30)	$ 10	_____	_____
Monday Night Social at the San Diego Zoo (Monday, 7/1)	$ 44	_____	_____
Children 14 and under	$ 39	_____	_____
Dinner Cruise (Tuesday, 7/2)	$ 75	_____	_____
Awards Banquet (Wednesday, 7/3)	$ 50	_____	_____
DAYTIME TOURS: (Lunch included in all daytime tours)			
Wine Country Tour (Saturday, 6/29)	$ 68	_____	_____
Scenic San Diego by Land and Sea (Sunday, 6/30)	$ 73	_____	_____
La Jolla: The Jewel of San Diego (Monday, 7/1)	$ 76	_____	_____
Behind the Scenes at the Wild Animal Park (Tuesday, 7/2)	$ 81	_____	_____

PAYMENT OPTIONS:

❒ Check Enclosed ❒ VISA ❒ MasterCard ❒ _____

TOTAL AMOUNT ENCLOSED $ _____
US FUNDS on US BANK

Expiration Date _____

Name on Card _____

Signature _____

JOIN TODAY AND SAVE!!!
(Attach a completed Membership application)
(See page 511 of this issue for a Membership application)

EXHIBITORS DO NOT USE THIS FORM

Workshops of IAFP 2002

Workshop I

Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*

This workshop is intended as an ongoing update of the science in the isolation of *Listeria monocytogenes*. Participants are exposed to the most current information on the advantages and disadvantages of currently employed technologies used in recovery of this pathogen. The evolution of each tool, its associated challenges and how these issues are overcome, pending changes in the various technologies and the quality aspects of each technology are discussed. This two-day workshop includes lectures and laboratory demonstrations at San Diego State University of various technologies from a vendor of each application as well as interaction from the presenter covering that specific methodology.

Workshop Topics

- Why Study *L. monocytogenes*
- Critical Steps in the Detection of *L. monocytogenes* Using:
  - Cultural Methods (USDA/FDA)
  - Immunological Methods
  - Nucleic Acid Methods
  - RAPD Ribotyping
  - Pulsed Field Electrophoresis
- Development and Validation of Methodologies for the Detection of *L. monocytogenes*
- USDA/FSIS Analysis of *L. monocytogenes*

Instructors

James R. Agin, Ohio Department of Agriculture, Reynoldsburg, OH
Bill Cray, Ph.D., USDA/FSIS Laboratory, Athens, GA
Judy Fraser-Heaps, General Mills, Apple Valley, MN
Anthony D. Hitchins, Ph.D., FDA/CFSAN, College Park, MD
Timothy C. Jackson, Ph.D., Nestlé USA, Dublin, OH
Franco Pagotto, Ph.D., Health Canada, Ottawa, Ontario, Canada
W. Payton Pruett, Jr., Ph.D., ConAgra Refrigerated Prepared Foods, Downers Grove, IL

Organizer

Robert W. Brooks, Woodson-Tenent Laboratories, Gainesville, GA

Who Should Attend?

This workshop is intended for the professional or laboratorian already working in the science of isolating *L. monocytogenes*. As the workshop is intended to hone the skills of laboratory personnel in recovery of this pathogen, it is assumed that the participants have a working knowledge of basic laboratory operations.

Hours for Workshop

Friday, June 28, 2002	Saturday, June 29, 2002
Registration – 7:30 a.m. Continental Breakfast	**Registration –** 7:30 a.m. Continental Breakfast
Workshop – 8:00 a.m. - 5:00 p.m. (Lunch provided)	**Workshop –** 8:00 a.m. - 4:00 p.m. (Lunch provided)

Workshop II

Current Practices in Produce Safety: GAPs and GMPs

In Partnership with United Fresh Fruit and Vegetable Association

The objective of this one and one-half day workshop is to discuss the impact of growing practices on the food safety of produce. Industry and university experts will present and share current knowledge regarding the application of "Good Agricultural Practices" for pre- and post-harvest produce.

The first day of the workshop will involve a one-half day field trip to local produce growing and packing operations to observe first-hand the practical applications of the materials presented.

On the second day of this session, participants will learn about relevant laws, microbial agents responsible for foodborne illness outbreaks linked to produce, chemical and physical hazards, and the most significant means of minimizing their associated risks.

Workshop Topics

- Good Agricultural and Manufacturing Practices in the Fresh Produce Industry
- Produce Industry Perspective on the Development, Implementation, and Verification of GAPs and GMPs
- Produce Specific Food Law
- Retail Buyer Perspective on the Development, Implementation, and Verification of GAPs and GMPs
- Produce Microbiology 101
- Impact of Growing and Post-harvest Practices on Produce Food Safety
- Safe Growing and Handling Practices to Reduce Chemical Hazards
- Safe Growing and Handling Practices to Reduce Microbial and Physical Hazards

Instructors

Robert E. Brackett, Ph.D., CFSAN/FDA, College Park, MD
Joe Furuike, Driscoll Strawberry Associates, Inc., Watsonville, CA
Robert B. Gravani, Ph.D., Cornell University, Ithaca, NY
Mark Harrison, Ph.D., University of Georgia, Athens, GA
Mahipal R. Kunduru, Ph.D., Dole Fresh Vegetables, Inc., Salinas, CA
Frances F. Pabrua, Fresh Express Inc., Salinas, CA
Gale Prince, The Kroger Co., Cincinnati, OH
Trevor V. Suslow, Ph.D., University of California-Davis, Davis, CA

Organizers

Philip G. Blagoyevich, The HACCP Institute, San Ramon, CA
Donna M. Garren, Ph.D., United Fresh Fruit and Vegetable Association, Alexandria, VA

Who Should Attend?

This workshop is intended for growers, shippers, and processors of fresh fruits and vegetables. Food safety and quality assurance professionals interested in produce food safety would also benefit from this workshop.

Hours for Workshop

Friday, June 28, 2002	Saturday, June 29, 2002
Registration —	**Registration —**
12:00 p.m. - 12:30 p.m.	7:30 a.m. Continental Breakfast
Tours —	**Workshop —**
12:30 p.m. - 5:00 p.m.	8:00 a.m. - 5:00 p.m. (Lunch provided)

Workshop III

Control of Pathogens in the Dairy Processing Environment

This workshop is intended to help dairy processing facilities design and implement an effective pathogen monitoring program for their products and their plant environment. With greater emphasis on HACCP in the dairies and mandatory HACCP for 100% juice processors, environmental monitoring can be invaluable as a pre-requisite program and product testing can be used to verify that HACCP is effective. This workshop will discuss the when, where, how and why of sampling both products and environment. A brief review of current technologies will help participants evaluate and choose appropriate tools to be used in their monitoring program. Participants will learn how data from a monitoring program provides the foundation for setting up pathogen control measures. Emphasis will be placed on determining effective corrective actions and follow-up testing for positive test results. Participants will have opportunities for interaction with the presenter to discuss points of interest.

Workshop Topics

- Overview of Pathogens of Concern to the Dairy Processor
- Sampling Plan for Environmental and Finished Products
- Methods of Sampling
- Overview of Methodology
- Corrective Actions/Follow-up and Auditing/ Verification
- Role of Training and Employee Awareness

Instructors

Kathryn J. Boor, Ph.D., Cornell University, Ithaca, NY
Larry Cohen, Kraft Foods, Inc., Glenview, IL
Beth Ann Crozier-Dodson, Kansas State University, Manhattan, KS
L. Michele Smoot, Ph.D., Silliker Laboratories Group, Inc., Carson, CA

Organizers

Paul A. Hall, Kraft Foods, Inc., Glenview, IL
Kay N. Sadler, New-Tech Consulting, Inc., Milford, OH
Gaylord B. Smith, Mohawk Associates, Schenectady, NY

(Workshop information continued on next page)

Who Should Attend?

This workshop is intended for dairy processors, quality assurance and food safety individuals.

Hours for Workshop

Saturday, June 29, 2002

Registration – 7:30 a.m.

Continental Breakfast

Workshop – 8:00 a.m. - 5:00 p.m.
(Lunch provided)

Workshop IV

Media Training for the Scientific Community

In Partnership with
International Food Information Council

The scientific community today is conducting cutting-edge, valuable research with the potential to enhance the safety of the world's food supply. There is also an open platform for food safety issues to be discussed and a golden opportunity to provide balance on controversial issues such as foodborne illness, BSE, food biotechnology and other new and emerging technologies. The media have proven to be key for scientists and food safety experts to get their message heard.

While the most common source of health and food safety information is the media, the most trusted sources include scientists as well as doctors. It is our goal to assist workshop attendees in developing practical media techniques, which are necessary for developing messages useful during media interviews. Message development and delivery are critical in providing the audience with the information you want heard.

Workshop Topics

- Effective communication strategies to communicate key messages to the audience
- Ways to identify your audience needs and provide them with information they need to know
- How to transform a negative interview into a positive one with strategic message development
- Intensive on-camera interview training

Instructors

Shelly Sims, Susan Peterson Productions, Washington, D.C.

Nan Tolbert, Susan Peterson Productions, Washington, D.C.

Organizers

Tony Flood, International Food Information Council, Washington, D.C.

Dave Schmidt, International Food Information Council, Washington, D.C.

Who Should Attend?

This workshop is intended for key professionals, experts in their field, who are responsible for communicating with the public via the media. *Due to the extensive, hands-on activities in this workshop,* ***attendance is limited to 10 participants.***

Hours for Workshop

Saturday, June 29, 2002

Registration – 7:30 a.m.

Continental Breakfast

Workshop – 8:00 a.m. - 4:30 p.m.
(Lunch provided)

Expand Your Knowledge

Register for a workshop prior to IAFP 2002!

Annual Meeting Workshops

♦ Registration Form ♦

Friday-Saturday, June 28-29, 2002

- ❑ Workshop I: Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*
- ❑ Workshop II: Current Practices in Produce Safety: GAPs and GMPs

Saturday, June 29, 2002

- ❑ Workshop III: Control of Pathogens in the Dairy Processing Environment
- ❑ Workshop IV: Media Training for the Scientific Community

First Name (will appear on badge) _____ Last Name _____

Company _____ Job Title _____

Address _____ City _____

State/Province _____ Country _____ Postal Code/Zip + 4 _____

Area Code & Telephone _____ Fax _____

E-mail _____ Member # _____

Payment Options:

❑ Check Enclosed ❑ VISA ❑ MasterCard ❑

Name on Card _____ Total Amount Enclosed _____

Signature _____ Expiration date _____

For further information, please contact the Association office at 800.369.6337; 515.276.3344; Fax: 515.276.8655; E-mail: jcattanach@foodprotection.org

Register by June 7, 2002 to avoid late registration fees

♦ Registration ♦

WORKSHOP I: Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*	Early Rate	Late Rate	WORKSHOP II: Current Practices in Produce Safety: GAPs and GMPs	Early Rate	Late Rate	WORKSHOP III: Control of Pathogens in the Dairy Processing Environment	Early Rate	Late Rate	WORKSHOP IV: Media Training for the Scientific Community	Early Rate	Late Rate
IAFP Member	$525.00	$600.00	IAFP Member	$325.00	$400.00	IAFP Member	$300.00	$375.00	IAFP Member	$650.00	$725.00
NonMember	$625.00	$700.00	NonMember	$425.00	$500.00	NonMember	$400.00	$475.00	NonMember	$750.00	$825.00

GROUP DISCOUNT:

Register 3 or more people from your company for one workshop and receive a 15% discount. Registrations must be received as a group. Discount does not apply to Workshop IV.

Refund/Cancellation Policy

Registration fees, less a $50 administrative charge, will be refunded for written cancellations received by June 14, 2002. No refunds will be made after that date; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 8, 2002. The workshop may be cancelled if sufficient enrollment is not received by June 7, 2002.

♦ 4 Easy Ways to Register ♦

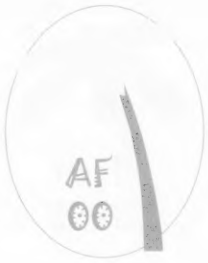
To register, complete the Workshop Registration Form and submit to the International Association for Food Protection by:

Online: www.foodprotection.org

Fax: 515.276.8655

Mail: 6200 Aurora Avenue, Suite 200W, Des Moines, IA 50322-2864, USA

Phone: 800.369.6337; 515.276.3344



CONTRIBUTE TO THE FIFTH ANNUAL FOUNDATION FUND SILENT AUCTION TODAY!

The Foundation of the International Association for Food Protection will hold its Annual Silent Auction during IAFP 2002, the Association's 89th Annual Meeting in San Diego, California, June 30–July 3, 2002. The Foundation Fund supports the:

- ★ Ivan Parkin Lecture
- ★ Travel support for exceptional speakers at the Annual Meeting
- ★ Audiovisual Library
- ★ Developing Scientist Competition
- ★ Shipment of volumes of surplus *JFP* and *DFES* journals to developing countries through FAO in Rome

Support the Foundation by donating an item today. A sample of items donated last year included:

- ★ Charleston Sweetgrass Basket
- ★ Food Safety Videos & Publications
- ★ Jeff Gordon Jacket
- ★ Phantom of the Marsh Print
- ★ Waterford Crystal Frame
- ★ White House 2001 Ornament
- ★ Wine
- ★ Wisconsin Master Cheesemaker Cheese Selection

Complete the form and send it in today.

Description of auction items _____

Estimated Value _____

Name of Donor _____

Company (if relevant) _____

Mailing Address _____

(Please specify: ❒ Home ❒ Work)

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-mail _____

Return to:

Donna Gronstal
International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Fax: 515.276.8655
E-mail: dgronstal@foodprotection.org

International Association for Food Protection®

Sponsorships

We invite you to participate as a sponsor for IAFP 2002. Sponsorship participation provides an excellent opportunity to position your company or organization as a supporter of the Association.

Several exciting opportunities will be available in 2002. Please review the event listing to select the one that will best position your organization. Reservations will be taken in order received for any open sponsorship events. A waiting list for events with a right of first option will be established.

SPONSORSHIP EVENT LIST

Amount	Event
$16,000	Monday Evening Social
$14,000	Opening Reception (Sunday)
$14,000	Exhibit Hall Reception (Monday)
$10,000	President's Reception (Tuesday)
$7,500	Badge Holders w/Lanyards
$3,250	Exhibit Hall Pastries and Coffee (Monday Morning)
$2,750	Exhibit Hall Coffee Break (Monday Afternoon)
$3,250	Exhibit Hall Pastries and Coffee (Tuesday Morning)
$2,750	Coffee Break (Tuesday Afternoon)
$2,750	Coffee Break (Wednesday Morning)
$2,250	Coffee Break (Wednesday Afternoon)
$3,500	Spouse/Companion Hospitality Room
$3,500	Student PDG Luncheon (Sunday)
$3,000	IAFP New Member Orientation (Saturday)
$3,000	Affiliate Reception (Saturday)
$2,000	Exhibitor Move-in Refreshments (Sunday)
$1,800	Awards Banquet Flowers (Wednesday)
$1,750	Committee Day Refreshments (Sunday)
$1,000	Speaker Travel Support
$600	Golfers' Continental Breakfast (Sunday)
$Various	Golf Tournament Prizes (Sunday)

Partial sponsorship for the above events is available.
Contact Dave Larson for details.

SPONSORSHIP PARTICIPANT

Name _____

Company _____

Address _____

City _____ State or Province _____

Country _____ Postal Code/Zip + 4 _____

Phone _____ Fax _____

E-mail _____

Desired Event to Sponsor _____

Amount Paid _____

Payment: ❑ Check ❑ Mastercard ❑ VISA ❑ American Express

Account Number _____

Expiration Date _____

Cardholder Signature _____

Payment Must be Enclosed for Order to be Processed
★ US Funds on US Bank ★

Contact:

Dave Larson
Phone: 515.440.2810
Fax: 515.440.2809
E-mail: larson6@earthlink.net

Exhibitors of IAFP 2002

Companies scheduled to exhibit as of May 5, 2002

Indicates IAFP Sustaining Member

3-A Sanitary Standards Symbol Administrative Council
1500 2nd Ave. S.E., Suite 209
Cedar Rapids, IA 52403
Phone: 319.286.9221 Fax: 319.286.9290
zeus.ia.net/~aaasansb

3M Microbiology Products
3M Center, Bldg. 275-5W-05
St. Paul, MN 55144-1000
Phone: 800.228.3957 Fax: 651.737.1994
www.3m.com/microbiology

AATI
2901 S. Loop Drive, Suite 3300
Ames, IA 50010
Phone: 515.296.6600 Fax: 515.296.6789
www.aati-us.com

ABC Research Corporation
3437 S.W. 24th Ave.
Gainesville, FL 32607
Phone: 352.372.0436 Fax: 352.378.6483
www.abcr.com

Advanced Instruments, Inc.
Two Technology Way
Norwood, MA 02062
Phone: 800.225.4034 Fax: 781.320.8181
www.aicompanies.com

AES – Chemunex, Inc.
301 N. Harrison St., Suite 109
Princeton, NJ 08540
Phone: 609.497.0166 Fax: 609.497.7307
www.chemunex.com

American Proficiency Institute
1159 Business Park Drive
Traverse City, MI 49686
Phone: 800.333.0958 Fax: 231.941.7287
www.foodpt.com

ANKOM Technology
140 Turk Hill Park
Fairport, NY 14450
Phone: 716.425.3940 Fax: 716.425.3941
www.ankom.com

BD Diagnostic Systems
7 Loveton Circle
Sparks, MD 21152
Phone: 410.316.4000 Fax: 410.316.4906
www.bd.com

BioControl Systems, Inc.
12822 S.E. 32nd St.
Bellevue, WA 98005
Phone: 800.245.0113 Fax: 425.603.0080
www.rapidmethods.com

bioMérieux, Inc.
595 Anglum Road
Hazelwood, MO 63042-2320
Phone: 314.731.8681 Fax: 314.731.8678
www.biomerieux-usa.com

Bioscience International, Inc.
11607 Magruder Lane
Rockville, MD 20852-4365
Phone: 301.230.0072 Fax: 301.230.1418
www.biosci-intl.com

California Department of Health Services, Food and Drug Branch
P.O. Box 942732, MS-357
Sacramento, CA 94234-7320
Phone: 916.445.2264 Fax: 916.322.6326
www.dhs.ca.gov

Cepheid
904 Caribbean Drive
Sunnyvale, CA 94089
Phone: 408.541.4191 Fax: 408.734.1260
www.cepheid.com

Charm Sciences, Inc.
659 Andover St.
Lawrence, MA 01843-1032
Phone: 800.343.2170 Fax: 978.687.9216
www.charm.com

Copan Diagnostics, Inc.
2175 Sampson Ave. #124
Corona, CA 92879
Phone: 800.216.4016 Fax: 909.549.8850
www.copanusa.com

Decagon Devices, Inc.
950 N.E. Nelson Court
Pullman, WA 99163
Phone: 800.755.2751 Fax: 509.332.5158
www.decagon.com

Deibel Laboratories of Illinois, Inc.
7120 N. Ridgeway
Lincolnwood, IL 60712
Phone: 847.329.9900 Fax: 847.329.9903
www.deibellabs.com

Diffchamb, Inc.
150 N. Michigan Ave., Suite 1200
Chicago, IL 60601-7594
Phone: 866.DIFFCHAMB Fax: 312.346.0683
www.diffchamb.com

DonLevy Laboratories
1551 E. 89th Avenue
Merrillville, IN 46410
Phone: 219.736.0472 Fax: 219.736.0539
www.donlevylab.com

DQCI Services, Inc.
5205 Quincy St.
Mounds View, MN 55112
Phone: 763.785.0484 Fax: 763.785.0584
www.dqci.com

DSM Food Specialties USA, Inc.
N89 W14475 Patrita Drive
Menomonee Falls, WI 53051
Phone: 800.423.7906 Fax: 262.255.7732
www.dsm.com

DuPont Qualicon
3531 Silverside Road
Bedford Bldg.
Wilmington, DE 19810
Phone: 800.863.6842 Fax: 302.695.5281
www.qualicon.com

Dynal Biotech, Inc.
HLA Division
555 Andorra Glen Court, Suite 5
Lafayette Hill, PA 19444
Phone: 866.DYNALTT Fax: 610.940.3606
www.dynalbiotech.com

Elsevier Science
655 Ave. of the Americas
New York, NY 10010
Phone: 212.633.3730 Fax: 212.633.3112
www.elsevier.com

EM Science
480 S. Democrat Road
Gibbstown, NJ 08020-1297
Phone: 856.423.6300 Fax: 856.423.6313
www.emscience.com

FDA – Center for Food Safey and Applied Nutrition
5100 Paint Branch Parkway
College Park, MD 20740
Phone: 888.SAFEFOOD
www.cfsan.fda.gov

Food Processors Institute
1350 I St. N.W., Suite 300
Washington, D.C. 20005
Phone: 800.355.0983 Fax: 202.639.5932
www.fpi-food.org

Food Quality Magazine
208 Floral Vale Blvd.
Yardley, PA 19067-5524
Phone: 215.860.7800 Fax: 215.860.7900
www.foodquality.com

Food Safety Magazine
1945 W. Mountain St.
Glendale, CA 91201
Phone: 818.842.4777 Fax: 818.769.2939

Food Safety Net Services, Ltd.
221 W. Rhapsody
San Antonio, TX 78216
Phone: 888.525.9788 Fax: 210.308.8730
www.food-safetynet.com

Food Safety Summit
Eaton Hall Expositions
256 Columbia Turnpike
Florham Park, NJ 07932
Phone: 800.746.9646 Fax: 973.514.5977

FoodHandler, Inc.
514 Grand Blvd.
Westbury, NY 11590-4712
Phone: 516.338.4433 Fax: 516.338.5486
www.foodhandler.com

FOSS
7682 Executive Drive
Eden Prairie, MN 55344
Phone: 952.974.9892 Fax: 952.974.9823
www.foss.dk

Hanna Instruments, Inc.
584 Park East Drive
Woonsocket, RI 02895
Phone: 401.765.7500 Fax: 401.765.7575
www.hannainst.com

Hardy Diagnostics
1430 W. McCoy Lane
Santa Maria, CA 93455-1005
Phone: 800.266.2222 Fax: 805.614.9274
www.hardydiagnostics.com

Hygiena
941 Avenida Acaso
Camarillo, CA 93012
Phone: 805.383.1303 Fax: 805.388.5531

IGEN International, Inc.
16020 Industrial Drive
Gaithersburg, MD 20877
Phone: 800.336.4436 Fax: 240.632.2206
www.pathigen.com

International Association for Food Protection
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322
Phone: 800.369.6337 Fax: 515.276.8655
www.foodprotection.org

International Association for Food Protection – Student PDG
6200 Aurora Ave., Suite 200W
Des Moines, IA 50322
Phone: 800.369.6337 Fax: 515.276.8655
www.foodprotection.org

International BioProducts
P.O. Box 0746
Bothell, WA 98041-0746
Phone: 800.729.7611 Fax: 425.398.7973
www.intlbioproducts.com

International Food Hygiene
P.O. Box 4
Driffield, East Yorkshire YO25 9DJ United Kingdom
Phone: 44.13.7724.1724 Fax: 44.13.7725.3640
www.positiveaction.co.uk

International Food Information Council Foundation
1100 Connecticut Ave. N.W., Suite 430
Washington, D.C. 20036
Phone: 202.296.6540 Fax: 202.296.6547
http://ific.org

International Life Sciences Institute (ILSI)
One Thomas Circle, 9th Floor
Washington, D.C. 20005
Phone: 202.659.0074 Fax: 202.659.8654
www.ilsi.org

Interscience
30, chemin du Bois des Arpents
St Nom la Breteche 78860 France
Phone: 331.34.62.62.61 Fax: 331.34.62.43.03
www.interscience.fr

IQ Scientific Instruments, Inc.
11021 Via Frontera, Suite 200
San Diego, CA 92127
Phone: 800.276.0723 Fax: 858.673.1853
www.phmeters.com

Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
Food & Drug Administration (FDA)
5100 Paint Branch Parkway
College Park, MD 20740
Phone: 301.436.1674 Fax: 301.436.2630
www.jifsan.umd.edu

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101 Philip Drive
Norwell, MA 02061
Phone: 866.269.9527 Fax: 781.871.6528
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Ste-Julie, Quebec J3E 2J9 Canada
Phone: 450.649.7343 Fax: 450.649.3113
www.labplas.com

Marine BioProducts, Inc.
1609 Derwent Way
Delta, British Columbia V3M 6K8 Canada
Phone: 604.523.2408 Fax: 604.523.2410
www.marbio.com

MATRIX MicroScience, Ltd.
Lynx Business Park
Fordham Road, Newmarket
Cambridgeshire, England CB8 7NY United Kingdom
Phone: 44.1638.723110 Fax: 44.1638.723111
www.matrixmsci.com

Medallion Laboratories
9000 Plymouth Ave. N.
Minneapolis, MN 55427
Phone: 800.245.5615 Fax: 763.764.4010
www.medlabs.com

Meritech, Inc.
8250 S. Akron St., #201
Englewood, CO 80112
Phone: 303.790.4670 Fax: 303.790.4859
www.meritech.com

Microbiology International
97H Monocacy Blvd.
Frederick, MD 21701
Phone: 800.396.4276 Fax: 301.662.8096
www.kr-technologies.com

Nasco
4825 Stoddard, P.O. Box 3837
Modesto, CA 95352-3837
Phone: 800.558.9595 Fax: 209.545.1669
www.enasco.com

The National Food Laboratory, Inc.
6363 Clark Ave.
Dublin, CA 94568-3097
Phone: 925.828.1440 Fax: 925.833.9239
www.thenfl.com

National Food Safety and Toxicology Center
165 Food Safety and Toxicology Bldg.
Michigan State University
East Lansing, MI 48824-1302
Phone: 517.432.3100 Fax: 517.432.2310
www.foodsafe.msu.edu

National Restaurant Association Educational Foundation
175 W. Jackson Blvd., Suite 1500
Chicago, IL 60604-2702
Phone: 800.765.2122 Fax: 312.583.9767
www.nraef.org

Nelson-Jameson, Inc.
2400 E. 5th St., P.O. Box 647
Marshfield, WI 54449-0647
Phone: 800.826.8302 Fax: 715.387.8746
www.nelsonjameson.com

Neogen Corporation
620 Lesher Place
Lansing, MI 48912-4144
Phone: 800.234.5333 Fax: 517.372.2006
www.neogen.com

NSF International
789 N. Dixboro Road
Ann Arbor, MI 48105
Phone: 800.NSF.MARK Fax: 734.769.0109
www.nsf.org

Orkin Pest Control
2170 Piedmont Road N.E.
Atlanta, GA 30324
Phone: 800.ORKIN.NOW Fax: 404.888.2012
www.acurid.com

Oxoid, Inc.
1926 Merivale Road
Nepean, Ontario K2G 1E8 Canada
Phone: 800.267.6391 Fax: 613.226.3728
www.oxoid.ca

PML Microbiologicals, Inc.
27120 S.W. 95th Ave., P.O. Box 570
Wilsonville, OR 97070
Phone: 800.628.7014 Fax: 503.570.2506
www.pmlmicro.com

The Proctor & Gamble Company
2 Proctor & Gamble Plaza
Cincinnati, OH 45202
Phone: 513.983.8349 Fax: 513.983.1583
www.pgbrands.com

Q Laboratories, Inc.
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Amendment to 3-A® Sanitary Standards for Compression-Type Valves for Milk and Milk Products, Number 53-01

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)
United States Department of Agriculture – Dairy Programs (USDA)

It is the purpose of the IAFIS, IAFP, USPHS, DIC, and USDA in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Compression-type valves heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, DIC, and USDA at any time. The 3-A Sanitary Standards and 3-A Accepted Practices provide hygienic criteria applicable to equipment and systems used to produce, process, and package milk, milk products and other perishable foods or comestible products. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

B3 **Surfaces**

B3.1 *Product Contact Surfaces:* Shall mean all surfaces that are exposed to the product or from which liquid may drain, drop or be drawn into the product.

B3.2 *Nonproduct Contact Surfaces:* Shall mean all other exposed surfaces.

B4 *Bond*: Shall mean the adhesive or cohesive forces holding materials together. This definition excludes press and shrink fits.

D2 **Permanent Joints**

D2.1 All permanent joints in metallic product contact surfaces shall be continuously welded.[1]

D2.2 Welding shall produce product contact surfaces which are at least as smooth as a No. 4 ground finish on stainless steel sheets and which are free of imperfections such as pits, folds, and crevices.

This amended 3-A Sanitary Standard for Compression-Type Valves for Milk and Milk Products, Number 53-02 is effective January 31, 2002.

[1]Criteria for hygienic welds may be found in AWS/ANSI D18.1 – *Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications*. Available from the American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126, phone: (305) 443-9353, fax: (305) 443-7559, E-mail: info@amweld.org; and EHEDG Doc. 9 – Welding Stainless Steel to Meet Hygienic Requirements. Available from the European Hygienic Equipment Design Group, Ellen Moens, Avenue Grand Champ 148, 1150 Brussels, Belgium.

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Coming Events

JUNE

·28-29, IAFP Workshops, San Diego, CA.

Workshop I – "Critical Steps in Laboratory Methods for the Detection of *Listeria monocytogenes*"

Workshop II – "Current Practices in Produce Safety: GAPs and GMPs"

·29, IAFP Workshops, San Diego, CA.

Workshop III – "Control of Pathogens in the Dairy Processing Environment"

Workshop IV– "Media Training for the Scientific Community"

See page 486 of this issue for additional workshop information.

·30-July 3, IAFP 2002, the Association's 89th Annual Meeting, San Diego, CA. Registration materials available in this issue of *DFES* on page 485 or visit our Web site at **www.foodprotection.org** for the most up-to-date Annual Meeting information.

·30-July 3, NEHA 66th Annual Educational Conference, Minneapolis Hilton Hotel, Minneapolis, MN. For additional information, call 303.756.9090.

JULY

·8-9, National Mastitis Council Regional Meeting, Holiday Inn Syracuse, Liverpool, NY. For additional information, call 608.224.0622; E-mail: nmc@nmconline.org.

·12-19, 22nd International Workshop/Symposium on Rapid Methods and Automation in Microbiology, Manhattan, KS. For further information, contact Daniel Y. C. Fung at 785.532.5654; E-mail: dfung@oznet.ksu.edu.

·18-19, Lead Auditor Seminar, St. Louis, MO. For more information, call ASI Food Safety Consultants, Jeanette Huge at 800.477.0778, ext. 302.

·28-31, 39th Annual Florida Pesticide Residue Workshop and 5th Annual Florida Foodborne Pathogen Analysis Conference, Trade Winds Island Grand Resort, St. Pete Beach, FL. For further information, contact W. George Fong at gandwfong@cs.com.

AUGUST

·12-16, Introduction to Food Science, Rutgers College, New Brunswick, NJ. For further information, contact Keith Wilson at 732.932.9271; E-mail: kwilson@aesop.rutgers.edu.

·17-22, 21st International Congress of Refrigeration, Washington, D.C. For further information, contact Nadine George at 301.984.9450 ext. 11; E-mail: nadineg@conferencemanagers.com.

·18-23, Food Micro 2002, Lillehammer, Norway. For additional information, contact MATFORSK, Norwegian Food Research Institute, at 47.64.97.01.00; E-mail: foodmicro@matforsk.no.

SEPTEMBER

·9-10, HACCP I: Documenting Your HACCP Prerequisite Program, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.

·10-11, Upper Midwest Dairy Industry Association Annual Meeting, Holiday Inn, St. Cloud, MN. For more information, contact Paul Nierman at 763.785.0484.

·10-14, National Society for Healthcare Foodservice Management (HFM) Training Conference, Boca Raton Resort, FL. For additional information, call HFM at 202.546.7236.

·17-19, New York Association for Food Protection Annual Meeting, Holiday Inn, Syracuse/Liverpool, NY. For more information, contact Janene Lucia at 607.255.2892.

·18-19, Wisconsin Association of Milk and Food Sanitarians, Inc. Joint Conference, Ramada Inn, Eau Claire, WI. For more information, contact Randy Daggs at 608.837.2087.

·18-20, "Thinking Globally — Working Locally: A Conference for Food Safety Education," Radisson Hotel Orlando, Orlando, FL. For more information, call 202.314.3459; E-mail: fsis.outreach@usda.gov.

·18-21, AWT Convention and Exposition, Disney's Coronado Springs Resort, Orlando, FL. For further information, contact Carrie Harley at 800.858.6683; E-mail: charley@awt.org.

·23-25, Indiana Environmental Health Association Fall Educational Conference, University Inn, West Lafayette. For more information, contact Helene Uhlman at 219.853.6358.

·24-26, Wyoming Environmental Health Association Annual Educational Conference, Camplex Center, Gillette. For more information, contact Sherry Maston at 307.322.9671.

·24-27, Congrilait 2002, 26th IDF World Dairy Congress, rue de Châteaudun, France. For additional information, call 330.1.49.70.71.71; E-mail: info@congrilait2002.com.

·24-27, Tecno Fidta 2002, 6th International Food Technology, Additives and Ingredients Exhibition and Conference, Buenos Aires, Argentina. For further information, contact Julie Bernier at 207.842.5583.

·25-27, Washington Association for Food Protection

Annual Meeting, Campbells' Resort, Chelan, WA. For more information, contact Bill Brewer at 206.363. 5411.

· 25-29, The 27th World Veterinary Congress, WORLDVET Tunisia 2002, Tunis, Tunisia. For further information, contact www.worldvetunisia2002.com.

OCTOBER

· 13-16, UW-River Falls Food Microbiology Symposium, University of Wisconsin-River Falls, River Falls, WI. For additional information, contact Doreen Cegielski at 715.425.3704; E-mail: foodmicro@uwrf.edu.

· 16, Good Manufacturing Practices and Food Safety, Cook College, Rutgers, New Brunswick, NJ. For additional information, contact Keith Wilson at 732.932.9271; E-mail: kwilson@aesop.rutgers.edu.

· 23-24, Associated Illinois Milk, Food, and Environmental Sanitarians Annual Meeting, Stony Creek Inn & Conference Center, East Peoria, IL. For more information, contact Larry Terando at 217.278.5900.

· 22-24, A Food Industry Approach to Quality System Evaluation, Atlanta, GA. For additional information, call AIB at 785.537.4750.

· 29, Statistical Process Control in the Food Industry, Part 1 of 2, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.

· 31, Brazil Association for Food Protection Annual Meeting, University of São Pãulo, São Pãulo, Brazil. For more information, contact Maria Teresa Destro at 55.113.818.2399.

· 31, North Dakota Environmental Health Association Annual Meeting, Holiday Inn Riverside, Minot, ND. For more information, contact Debra Larson at 701. 328.6150.

NOVEMBER

· 4-5, GMP Workshop for Packaging Supplier, Manhattan, KS. For additional information, call AIB at 785.537.4750.

· 8-9, Mexico Association for Food Protection Annual Fall Meeting, Mission Carlton Hotel, Guadalajara, Mexico. For more information, contact Lydia Mota De La Garza at 01.5794.0526.

· 20-21, Alabama Association for Food Protection Annual Meeting, Holiday Inn-Homewood, Birmingham, AL. For more information, contact G. M. Gallaspy at 334. 206.5375.

· 20-22, HACCP II: Development of Your HACCP Plan, Guelph Food Technology Centre, Guelph, Ontario, Canada. For more information, call Marlene Inglis at 519.821.1246; E-mail: gftc@gftc.ca.

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Requirements:

5-6 years experience establishing food quality control programs, 5 years extensive experience interacting with regulatory groups, experience monitoring food vendor quality control programs, and monitoring HACCP and food safety programs, as well as operations, product development or quality control experience in a QSR chain. Other requirements include: College level microbiology with an understanding of food pathogens, knowledge of FDA, USDA, state and local food and health regulations, the ability to write business and technical letters, the ability to Speak in front of large groups of people 25 or more, and must have knowledge of federal "Good Manufacturing Practices" and general sanitation of food facilities.

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Continued from page 512

wrapper full of holes." His concern is well founded, considering some of these violations, reported for public water systems in the USEPA's "Factoids: Drinking Water and Ground Water Statistics for 2000":

Contaminant	# of systems	# of people affected
Total Coliform Rule	6,988	10,568,943
Organics (VOCs & SOC)	70	1,083,122
Radionuclides	195	574,345
Lead & Copper	1,548	8,075,452

1997-1998 USEPA/CDC data showed 17 waterborne disease outbreaks related to public water supplies in 13 states. Clearly, it is a mistake to believe that waterborne diseases are a problem only in underdeveloped countries with poor sanitary systems. Even though most public water supplies monitor for the presence of Coliform bacteria, the presence of other infectious agents is often not monitored. Waterborne enteric pathogens such as *Cryptosporidia, Giardiasis, Cyclospora, and Escherichia coli* O157:H7 have caused outbreaks of disease in the US and throughout Canada in the 1990s and continuing into the 2000s. These microbes are very dangerous to the ever-increasing number of elderly people, infants, and auto-immune compromised individuals.

In addition to harmful infectious agents that may be present in a water supply, contaminants such as lead, copper and arsenic can pose serious heath risks. Who is liable/responsible when a food processing operation or restaurant uses water with unhealthful levels of these contaminants when making or serving food to the general public? What about the negative public relations impact of any water quality incident?

Are water quality problems communicated in a timely fashion to the foodservice industry to avert any food safety problems? Consider the common occurrence of a "boil water alert." It may be communicated to state and local health officials, but how do those who use water as an ingredient get notified before they use it? When utilities become concerned about the presence of microbials in the water supply, often more disinfectant is added. Disinfectants such as chlorine, however, can cause cancer-causing by-products (THMs, chlorimines, etc.), and are not effective in controlling enteroviruses that can lead to outbreaks of waterborne diseases.[5]

The quality of a water supply should not be taken as a given in any part of the food chain. Any party using water as an ingredient in the food process must determine its "potability" from start to finish. A standard for water as an ingredient should be set for its various uses. The water supply used in the food chain should be identified as "public" or "private," its "potablity" documented and regularly monitored, and its health-effect constituents screened. Regular water tests by a certified lab will show if something has entered the supply that could affect the quality of the food product.

If you are interested in the preceding questions and raising the awareness of water quality from that of a "stealth" ingredient to that of any other critically monitored food ingredient, plan to attend the Water Quality and Safety PDG meeting at 12:30 p.m. on Sunday, June 30th at IAFP 2002. Your participation is requested!

1. "U.S. Drinking Water Challenges in the twenty-first Century," by Ronnie Levin, et.al., Feb 2002, *Environmental Health Perspectives, Reviews in Environmental Health*, Harvard School of Public Health.
2. "The Threat of Chemical and Biological Agents to Public Water Supply Systems", Rolf, A. Deininger, School of Public Health, University of Michigan, June 2000.
3. FDA Center for Food Safety & Applied Nutrition, January 9, 2002.
4. R. A. Deininger et al. (eds.) *Security of Public Water Supplies*, 2000, Kluwer Academic Publishers.
5. Talk entitled "Impact of Water Quality on Food Safety," by Mark Lechevallier, presented at the IAFP 88th Annual Meeting, Minneapolis, MN August 5-8, 2001.

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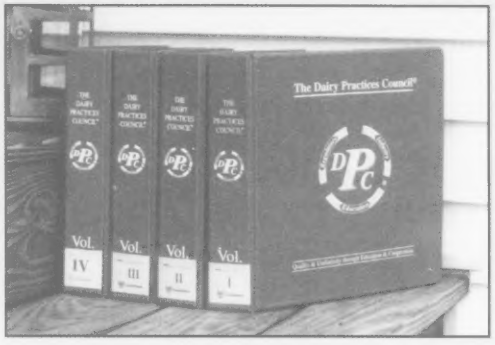

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THOUGHTS on Today's Food Safety...

Issues on Water Quality and Safety

Susan McKnight
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Harvard University School of Public Health in February 2002 released a report stating that, "at least $151 billion needs to be spent over the next 20 years to guarantee the continued high quality of water in the United States. The human health impact of poor water quality ranges from increased incidence of gastrointestinal illness to suspected cancers caused by long term exposure to the by-products of water treatment."[1]

The Environmental Protection Agency (EPA) Administrator Christie Whitman, quoted in the Chicago Tribune on March 28, 2002, said "Water is going to be the biggest environmental issue that we face in the 21st Century, in terms of both quantity and quality."

These statements lead one to ask, "How is water being used as an ingredient in food products, and is it being adequately monitored?"

Water is an important food ingredient that is used throughout the farm-to-table chain, yet the role that its quality plays in food safety has been missing from most food safety discussions. Water is used in everything from beverages and soups to food processing. The Food Code of the Food and Drug Administration (FDA) requires retail foodservice operations and institutions to use "potable" water that is periodically tested to be in compliance with the EPA drinking water standards. How the Food Code gets translated to day-to-day food processing operations and beverage quality in foodservice operations is unclear. What do most foodservice operations know about the EPA's drinking water standards? What water standards, if any, are being used in food processing outside the US? Water quality cannot be assured by a hash mark on an audit sheet showing that a water test result is on file. Is the ingredient water, monitored and analyzed with the same care as other ingredients? The foodservice industry routinely requires vendor/supplier quality assurance guarantees as part of HACCP programs, but how is water quality monitored in those programs? These questions need further examination and IAFP's new Professional Development Group (PDG) on Water Quality and Safety plans to explore them at their initial meeting, June 30 at IAFP 2002 in San Diego, California.

Recent events have caused the security of water supplies to be a major topic of concern. In a report titled, "Threats from Chemical and Biological Agents to Public Water Supply Systems,"[2] a leading consultant to FEMA (Federal Emergency Management Agency) expressed concern about the vulnerabilities of the water system along the route the water travels, from the source to the processing plant to the tap. He wrote, "...[T]he attack by a criminal has more chances of success if the [water] system is attacked after the treatment plant."

In January 2002, the FDA's Center for Food Safety addressed the topic of water safety and issued guidelines regarding the security of water:

Food establishment operators should consider: Security of water

- securing water wells, hydrants, storage and handling facilities
- ensuring that water systems and trucks are equipped with backflow prevention
- testing for portability regularly, as well as randomly, and being alert to changes in the profile of the results
- chlorinating water systems and monitoring chlorination equipment
- maintaining contact with the public water provider to be alerted to problems
- identifying alternate sources of potable water (e.g., trucking from an approved source, treating on-site or maintaining on-site storage).[3]

Ian Walker, in his article "The Impact of the Distribution System on Water Quality: A UK Perspective,"[4] expresses concern that the water industry is one of the few manufacturers that takes great effort to safeguard its product during production, but then delivers it to the customers in a dirty

Continued on page 504

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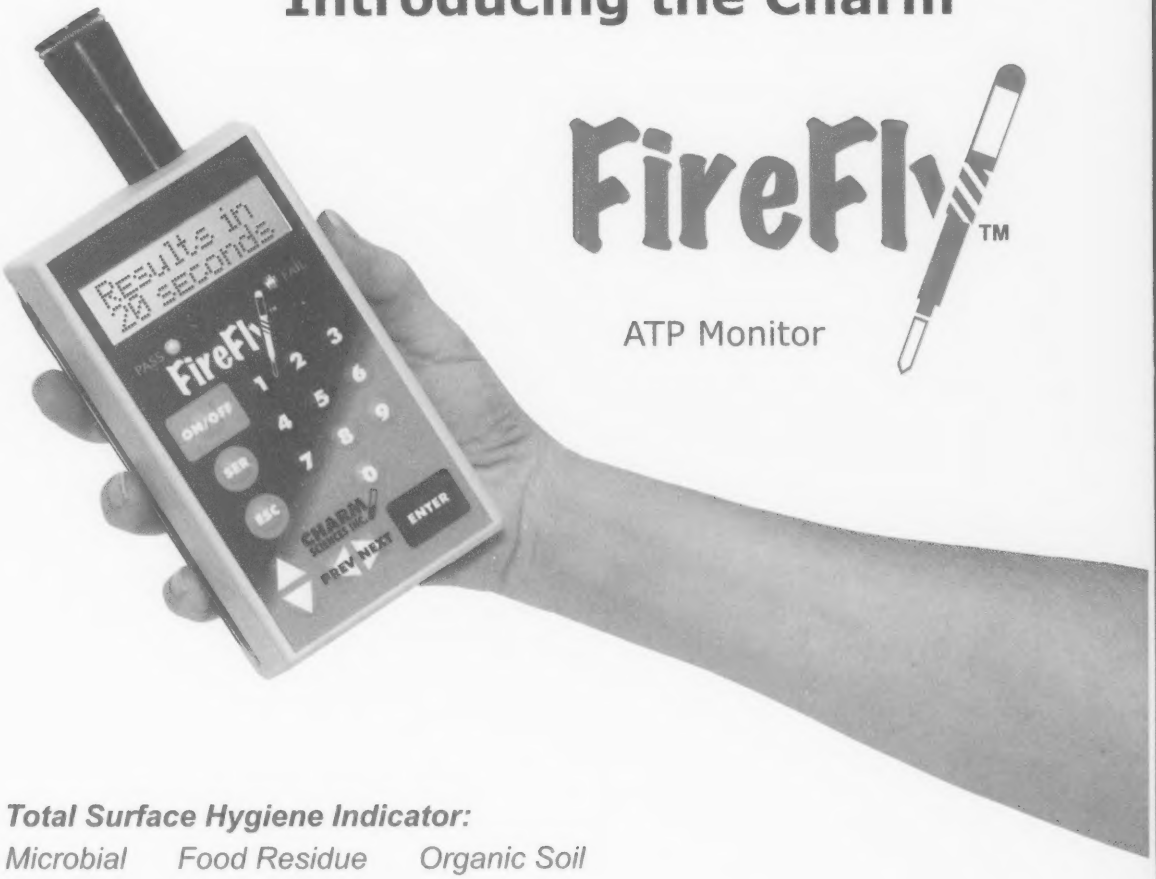

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